

**A1-F18AC-SRM-250**

**1 January 1995**

**Change 6 - 15 June 2002**

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**TECHNICAL MANUAL**

**ORGANIZATIONAL, INTERMEDIATE, AND DEPOT  
MAINTENANCE**

**STRUCTURE REPAIR**

**TYPICAL REPAIR**

**NAVY MODEL**

**F/A-18A/B/C/D**

**161353 AND UP**

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**NATEC ELECTRONIC MANUAL**

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044 00		17.....	3				
1.....	1	18.....	3				
2.....	1	19.....	3				
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3.....	1	34.....	3				
4.....	1	35.....	3				
5.....	1	36.....	3				
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12 blank .....	1	4.....	1				
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6.....	1	9.....	1				
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**LIST OF TECHNICAL PUBLICATION DEFICIENCY REPORTS INCORPORATED**

**ORGANIZATIONAL, INTERMEDIATE, AND DEPOT MAINTENANCE**

**STRUCTURE REPAIR**

**TYPICAL REPAIR**

**This WP supersedes TPDR WP, dated 1 December 2001.**

- 
1. The TPDRs listed below have been incorporated in this issue.

IDENTIFICATION NUMBER/ QA SEQUENCE NUMBER	LOCATION
None	



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## WORK PACKAGE INDEX

## ORGANIZATIONAL, INTERMEDIATE, AND DEPOT MAINTENANCE

## STRUCTURE REPAIR

This WP supersedes WP001 01, dated 1 August 1997.

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001 00	Alphabetical Index	015 00	Graphite Epoxy Skin and Aluminum Honeycomb Core, Class IV Damage Repair
001 01	Work Package Index	016 00	Graphite Epoxy Skin and Aluminum Honeycomb Core, Class V Damage Repair
002 00	Introduction	017 00	Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VI Damage Repair
003 00	Storage, Preparation and Handling Procedures for Structural Adhesive	018 00	Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Classes V, VI, or VII Damage Repair
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011 01	Graphite Epoxy Skin, Class V Damage Repair		
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<b>WP Number</b>	<b>Title</b>	<b>WP Number</b>	<b>Title</b>
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026 00	Aluminum or Titanium Skin and Aluminum Honeycomb Core, Class V Damage Repair	037 00	Titanium Sheet Repairs, Across Structure and Lands
027 00	Aluminum or Titanium Skin and Aluminum Honeycomb Core, Class VI Damage Repair	038 00	Blending
028 00	Aluminum or Titanium Skin and Aluminum Honeycomb Core, Class VII Damage Repair	039 00	Fiberglass or Aramid Assembly, Class I Damage Repair
029 00	Aluminum or Titanium Skin and Aluminum Honeycomb Core, Class VIII Damage Repair	040 00	Fiberglass or Aramid Assembly, Class II Damage Repair
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031 00	Aluminum Sheet, Free of Structure and Land Areas	042 00	Fiberglass or Aramid Assembly, Class IV Damage Repair
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		048 00	Use of Equipment History Record (EHR) Card
		049 00	Tin/Zinc Coating
		050 00	Elastomeric Coating



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## INTRODUCTION

### ORGANIZATIONAL, INTERMEDIATE, AND DEPOT MAINTENANCE

### TYPICAL REPAIR

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#### 1. PURPOSE.

2. This manual provides typical repair procedures for organizational, intermediate, and depot levels of maintenance. The maintenance level, damage and repair limits are identified in the structure series manual containing the damaged assembly. The structure series manual will reference this manual for repair.

#### 3. REQUISITION AND AUTOMATIC DISTRIBUTION OF NAVAIR TECHNICAL MANUALS.

4. Procedures to be used by Naval activities and other Department of Defense activities requiring NAVAIR technical manuals are defined in NAVAIR 00-25-100 and NAVAIRINST 5605.5.4A.

5. To automatically receive future changes and revisions to NAVAIR technical manuals, an activity must be established on the Automatic Distribution Requirements List (ADRL) maintained by the Naval Air Technical Data and Engineering Service Command (NATEC). To become established on the ADRL, contact your activity central technical publications librarian. If your activity does not have a library, you may establish your automatic distribution by contacting the Commanding Officer, NATEC, Attn: Distribution, NAS North Island, Bldg. 90, P.O. Box 357031, San Diego CA 92135-7031. Reconfirmation of these requirements is necessary once a year to remain on automatic distribution. Please use your NATEC assigned account number when referring to automatic distribution requirements.

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#### 7. MANUAL ISSUE DATE.

8. The date on the title page is the copy freeze date. No additions, deletions, or changes are made after the manual issue date, except last minute safety of flight or required maintenance changes. Data collected after the manual issue date will be included in later changes or revisions of the manual.

#### 9. AIRCRAFT DESCRIPTION.

10. The F/A-18A and F/A-18C are single place fighter/attack aircraft; the F/A-18B and F/A-18D are two place versions. They are powered by two F404-GE-400 turbofan engines with afterburner. The aircraft have a variable chamber mid wing with leading edge extensions. The two vertical stabilizers are angled outboard 20° from vertical. The wings have hydraulically actuated leading and trailing edge flaps and ailerons. The rudders and stabilators are also hydraulically controlled. The airframe is primarily made of aluminum. Graphite epoxy composite compound is used for many skins and doors. Titanium is also used for skins and doors. Where maximum strength is required, beta annealed bar, plate and forgings are used. High strength steel is used in the landing and arresting gear. Hydraulic tube assemblies are titanium.

#### 11. EFFECTIVITIES.

12. Effectivity notes on manual title pages, work package title pages, and within a work package indicate the aircraft to which the data applies. If no

effectivity note appears on the work package title page, the work package has the same effectivity as shown on the manual title page. The effectivity notes may use:

**NOTE**

Aircraft with model designator F/A-18B are the same type and model as TF/A-18A.

- a. Type, model, and series
- b. Bureau number (tail number)
- c. Combination of type, model series, and bureau numbers
- d. Part number or serial number
- e. Technical directive number

The table below shows examples of effectivity notes and their meanings:

**Effectivity Note Examples**

Effectivity Note	Definition
161362 AND UP	Applicable to all F/A-18A, F/A-18B, F/A-18C and F/A-18D for bureau numbers listed.
F/A-18A, F/A-18B	Applicable to all F/A-18A and F/A-18B
F/A-18C, F/A-18D	Applicable to all F/A-18C and F/A-18D.
F/A-18A	Applicable to all F/A-18A, but not F/A-18B, F/A-18C, and F/A-18D.
F/A-18B	Applicable to all F/A-18B, but not F/A-18A, F/A-18C, and F/A-18D.
F/A-18C	Applicable to all F/A-18C, but not F/A-18A, F/A-18B, and F/A-18D.
F/A-18D	Applicable to all F/A-18D, but not F/A-18A, F/A-18B, and F/A-18C.
F/A-18A, F/A-18C	Applicable to all F/A-18A and F/A-18C, but not to F/A-18B and F/A-18D.
F/A-18B, F/A-18D	Applicable to all F/A-18B and F/A-18D, but not to F/A-18A and F/A-18C.
F/A-18A 161353, 161359 THRU 161364	Only applicable to some bureau numbers of F/A-18A. Not applicable to any F/A-18D, even if a F/A-18D bureau number is within the numbers listed.
F/A-18A 163427, 163449 THRU 163546	Only applicable to some bureau numbers of F/A-18C. Not applicable to any F/A-18D, even if a F/A-18D bureau number is within the numbers listed.
F/A-18B 161354 AND UP	Only applicable to some bureau numbers of F/A-18B. Not applicable to any F/A-18A, even if an F/A-18A bureau number is within the numbers listed.

**Effectivity Note Examples (Continued)**

<b>Effectivity Note</b>	<b>Definition</b>
F/A-18D 163434 AND UP	Only applicable to some bureau numbers of F/A-18D. Not applicable to any F/A-18C, even if a F/A-18C bureau number is within the numbers listed.
161353 THRU 161356 BEFORE F18 AFC 772	Applicable to F/A-18A and F/A-18B for bureau numbers listed, before modification by technical directive.
161357 AND UP, ALSO 161353 THRU 161356 AFTER F18 AFC 772 AND F/A-18C, F/A-18D	Applicable to aircraft modified during production; also applicable when affected aircraft have been modified by technical directive.
P/N 74A210001-1001, 74A210001-1003, AND 74A210001-1005	Applicable to assemblies which are interchangeable between aircraft.
Outer Wing, Assembly Serial Number, A13-0022	Applicable to assemblies which are interchangeable between aircraft, but configurations cannot be identified by part number.

**13. TECHNICAL DIRECTIVES.**

14. Technical directives are documents which direct the accomplishment and recording of a retrofit configuration or inspection to delivered aircraft, or aircraft components.

**15. AIRFRAME CHANGE (AFC) AND AIRBORNE SOFTWARE CHANGE (ASC).**

Technical directives which change configuration of aircraft structure or equipment installation, i.e. AFC, will list aircraft bureau numbers in effectivity notes and show before and after the AFC. Technical directives which change configuration of operational flight programs (OFP), i.e. ASC, will list the OFP CONFIG/IDENT NUMBER in effectivity notes and show the latest two authorized OFP programs. See AFC and ASC effectivity examples in Effectivity Note Example Table.

**16. AIRCRAFT COMPONENT CHANGES.**

Technical directives which change configuration of aircraft components, i.e. AAC, ACC, AVC, AYC, and PPC will list part numbers in the Effectivities. See AVC effectivity examples in Effectivity Note Example table.

AFC	Airframe Change for aircraft structure and equipment
ASC	Airborne Software Change for operational flight programs
AVC	Avionics Change for airborne electronic equipment, including wiring changes
AYC	Accessory Change for mechanical system
PPC	Power Plant Change for engines

**17. RECORD OF APPLICABLE TECHNICAL DIRECTIVES.**

18. The technical directives affecting this manual are listed in the Record of Applicable Technical Directives of each affected work package. Because an ASC directs all aircraft be modified within 30 days, ASC's are not listed. When all affected aircraft are modified, the before configuration is removed from the manual, and the technical directive entry is removed from the Record of Applicable Technical Directives.

**19. HOW TO USE THE MANUAL.**

Text and illustrations contained in this manual are in work package format. These work packages are complete sets of data or procedures arranged in a logical sequence supplying instructions, references,

AAC	Aviation Armament Change for armament equipment
ACC	Aircrew System Change for aircrew survival equipment

and material/equipment requirements for doing each repair. Work package types contained in this manual are listed below:

a. Alphabetical Index Work Package. This work package contains an alphabetical listing, by title, of each work package contained within the manual. This work package is numbered 001 00.

b. Introduction Work Package. This work package contains introductory information for the repair persons use. This work package is numbered 002 00.

c. 'General Information Work Package. General information work packages contain repetitious information related to typical repair and referenced as needed. An example of a general information work package is 003 00.

d. Numerical Index of Effective Work Packages/Pages. This index (A page) provides the user with the current status of the publication.

e. Typical Procedure Work Packages. Typical repair work packages are those which contain information applicable to more than one structural group or component. An example of a typical repair work package is 008 00.

f. Technical Publication Deficiency Report (TPDR) Work Package. This work package lists deficiency reports incorporated into a specific manual during changes/revisions. This work package is numbered TPDR-1.

## 20. WARNINGS, CAUTIONS, AND NOTES.

21. Items of special importance and critical information are identified in warnings, cautions, and notes. Warnings and cautions appear immediately before the step to which they apply. Notes may appear before or after the affected step.

### WARNING

Warnings describe conditions or procedures that could result in injury or death if correct procedures are not followed.

### CAUTION

Cautions describe conditions or procedures that could result in damage to or destruction of equipment if correct procedures are not followed.

### NOTE

Notes describe or clarify conditions or procedures.

## 22. SAFETY PRECAUTIONS.

23. Safety precautions applicable to typical repairs are contained in general information and the typical repair work packages as needed.

## 24. TECHNICAL PUBLICATION DEFICIENCY REPORTS (TPDR).

25. The TPDR (OPNAV FORM 4790/66) is the form for reporting errors and suspected omissions in the technical manuals. Reporting procedures are in OPNAVINST 4790.2 SERIES.

## 26. QUALITY ASSURANCE PROCEDURES.

27. Procedures or parts of procedures which require quality assurance inspection are identified by the letters (QA) after the applicable steps. When (QA) is assigned to a step or a heading which is immediately followed by substeps, the inspection requirement is applicable to all substeps.

28. When doing maintenance in any area, a visual inspection of the area will be made for cracks, corrosion, and security of component installation before securing the area for flight.

## 29. REPAIR TERMS.

30. The list below gives definitions for the commonly used typical repair methods plus terms of a general nature which may be applicable.

## A

**A-SCAN** - A data presentation method for ultrasonic inspection. Data is displayed on a cathode ray tube (CRT). Sound energy amplitude is plotted on the vertical axis and distance (or time of flight) on the horizontal axis.

**ADHESIVE** - A glue-like material used to produce a strong bond between two parts by surface attachment. Adhesives take the form of films, foams, pastes, or liquids.

**ADHESIVE OUT-TIME** - See OUT-TIME.

**ADVANCED COMPOSITE MATERIALS (ACM)** - A combination of high strength, high extensional stiffness fibers (boron, carbon, aramid) embedded in a matrix material (epoxy, BMI, and so forth).

**AMBIENT TEMPERATURE** - Temperature of the surrounding environment.

**ANGLE PLY LAMINATE** - Laminates composed of lamina oriented at different angles (typically 0,  $\pm 45$  and 90 degrees) to a stated reference direction.

**ARAMID FIBER (SEE KEVLAR)** - Generic name for a class of synthetic fibers made by the dry-jet wet spinning process. Aramid fibers are characterized by toughness and impact resistance. Laminates made using these fibers are notoriously difficult to machine and drill.

**AUTOCLAVE** - A vessel capable of providing heat and pressure for curing advanced composite laminates, composite bonded assemblies and metallic bonded assemblies.

## B

**B-STAGE** - An intermediate stage in the curing of a thermosetting resin that is between completely uncured (A-STAGE) and completely cured (C-STAGE). The resin in this stage has been partially reacted and is normally a solid at room temperature. The resin melts to a liquid state when heat is applied. Uncured film adhesive and prepreg materials are provided in this stage.

**BCM** - Beyond capability of maintenance. A part that is BCM is sent to the next higher level of maintenance for repair.

**BLEEDING** - The removal of resin from composite prepreg or wet layup into bleeder plies during the cure process. Resin bleeding is used to remove volatiles, to facilitate ply to ply bonding and to remove excess resin from the laminate.

**BLEEDER PLIES** - A layer of material (usually Style 120 fiberglass or equivalent) used to absorb excess resin from a composite laminate. The amount of resin removed from the laminate is a function of the number of bleeder plies used and the type of bleeder ply material. Bleeder plies are removed from the laminate after cure and discarded.

**BLISTERING** - A bubble like swelling on the surface of a laminate usually the result of thermal damage.

**BLOWING AGENT** - A heat activated nitrogen releasing material used in foaming adhesives to cause expansion.

**BLOWN CORE** - Honeycomb core that has experienced skin to core disbonds and/or node bond failures.

**BOND** - The attachment of one surface to another through the use of an adhesive as a gluing agent.

**BOND STRENGTH** - The load carrying capacity of two materials attached through the use of an adhesive.

**BONDLINE** - The adhesive layer between two materials attached through the use of an adhesive.

**BREATHER CLOTH** - A layer of coarse woven cloth, usually Style 181 fiberglass or equivalent, or mat used in vacuum bagging to allow venting or breathing by providing separation between the vacuum bag and the part.

## BRIDGING

(1) An unsupported area on a part being vacuum bagged that can result in bag failure when pressure is applied.

(2) A condition that can exist in a composite layup where inadequate pressure is applied during cure resulting in voids.



## C

**C-SCAN** - A data presentation method for ultrasonic inspection which provides a plan view of the part scanned using an X and Y coordinate system. A hard copy of the data presented can be provided.

**CARBON FIBER** - A strong, high extensional stiffness fiber produced by the carbonization of a synthetic material similar to rug yarn. When compared to graphite fibers, carbon fibers are carbonized at a lower temperature, have less elemental carbon present following carbonization, 80-95 % versus 99 % for graphite, and have a lower extensional stiffness. The terms carbon and graphite have been used interchangeably but the fibers used on naval aircraft are technically carbon.

**CAUL PLATES** - Smooth metallic or plastic plates used in a composite layup or on a repair part to distribute pressure.

**COBONDING** - The process of curing a composite patch and an adhesive in a single step.

**COEFFICIENT OF THERMAL EXPANSION (CTE)** - The fractional change in length of a material with each degree of change in temperature. Composite materials generally have low CTEs when compared to metallic materials.

**COGNIZANT FIELD ACTIVITY (CFA)** - The U.S. Navy activity that has assigned engineering responsibility for a given aircraft (weapon system).

**COIN TAP** - The technique of lightly tapping the surface of a bonded part in the area of suspected defect. Applicable for detecting disbonds and delaminations in bonded honeycomb sandwich assemblies with thin face sheets but not effective for finding defects in thick laminates. The presence of a defect is indicated by a change in tone. Further inspection using an ultrasonic technique is always required in suspected areas identified by coin tap.

**CONTAMINANT** - A foreign substance introduced into a bond line, laminate, or core material during the layup process that degrades the strength of the part.

**CURE** - The chemical process during which a thermosetting resin is irreversibly changed from a weak flexible material into strong rigid material. Both polymerization and cross-linking occur during this process.

**CURING AGENT** - (1) The chemical compound in a thermosetting resin that links molecular chains during the cure process. (2) Part B in a two part adhesive system which combines with the base resin to produce a cured material.

## D

**DEGAS** - Removal of air and volatiles from a laminate or patch bond during the cure cycle. Air and volatiles not removed during the cure process result in voids.

**DELAMINATION** - The separation of the layers or plies in a laminate. It may occur during fabrication or sometime during the service life of the part. Most frequently caused by impact forces. This term is often confused with the term DISBOND.

**DESSICANT** - A substance which absorbs moisture. A color changing version (calcium sulfate containing cobalt chloride) can be used as moisture detector during the drying process.

**DISBOND** - Lack of adhesion between members in a bonded joint or part. It can occur during part fabrication or sometime during the service life of the part. It may be caused by improper fit of bonded details, contamination of the adhesive or bonded details during the layup process, failure of the adhesive bond line (due to) as a result of cure cycle stresses, handling damage, or corrosion of metallic bonded members. This term is often confused with the term DELAMINATION.

**DWELL** - SEE SOAK.

## E

**ECCENTRICITY** - The amount by which two load paths in a bonded or bolted joint are not coincident.

**EIGHT (8) HARNESS SATIN WEAVE** - A weave pattern in which the fill fiber tows proceed over 7 warp fiber tows before passing under a warp fiber tow. This weave pattern is used for fabrication and repair of complex contours and substructure details, see figure 1.

**EMBOSSSED/STAGED ADHESIVE** - Film adhesive subjected to a short duration low temperature heat cycle during which a honeycomb core pattern is imprinted on the adhesive surface.

The pattern provides a leak path for volatile extraction during the initial stages of the cure cycle. The staging process also removes residual solvent from the adhesive.

**ENVELOPE BAG** - A vacuum bag that completely surrounds the part. Used for drying honeycomb sandwich parts and when an oven or autoclave is used as the primary heat source for curing repairs.

**EPOXY** - A thermosetting resin made by reaction of epoxide groups. They are used for adhesives and are the most commonly used matrix materials for structures made from ACM. Most epoxies have an upper service temperature limit of 250° F.

**EXOTHERM** - The liberation of heat during the curing of a thermosetting resin.

**EXTENSIONAL STIFFNESS** - The ability of material to resist elongation or extension when a load is applied.

## F

**FIBER** - A strand of material with length as its one major dimension. It is used as the primary load carrying member in a composite laminate.

**FIBER DIRECTION** - The orientation or alignment of fibers within a laminate with respect to a stated reference direction.

**FILM ADHESIVE** - One part adhesive systems cast into thin sheet during adhesive manufacture. The sheet is supported by a scrim cloth carrier material.

**FILL DIRECTION** - The direction of the fiber tows in a woven laminate that are oriented at right angles to the warp tows, see figure 1.

**FILLET BOND** - The adhesive bond between face sheets and honeycomb core material in a honeycomb sandwich assembly. The adhesive creates a fillet with the honeycomb core as shown in figure 2.

**FLAT PLY COLLATION** - To collect or arrange plies of composite material during the layup process in the correct sequence and orientation on a flat surface.

**FLOW** - The movement of an uncured resin under heat and pressure. The amount of flow of an uncured resin is a measure of the degree of aging the material has experienced. It can be an indicator of how usable the material is for performing repairs.

**FLUTTER** - A condition experienced by fully reversible flight control surfaces, rudders, ailerons, stabilizers, that can result in part failure. The condition may be caused by addition of weight during the repair process or by the repair adversely altering the part stiffness.

**FOAMING ADHESIVE** - An epoxy film adhesive containing a blowing agent. It is used as a strong, lightweight core splice material.

## G

**GEL** - The point during the cure of a thermoset material when the viscosity increases to the point where flow is no longer possible.

**GRAPHITE FIBER** - Carbon based fiber with a higher extensional stiffness and higher percentage of elemental carbon than the carbon fiber, see CARBON FIBER.

## H

**HONEYCOMB CORE** - Thin foil metallic or non-metallic formed to a cellular configuration. The foil is bonded at node points to form the core. When bonded to a relatively thin face sheets, it provides a strong, lightweight assembly with exceptional stiffness, see figure 2.

## I

**IMPACT ENERGY** - The energy resulting from dropped tools, equipment, or other objects striking an object. This energy may cause dents and/or delamination damage to composite laminates depending on the amount of energy imparted to the laminate. The energy is measured in foot-pounds.

Note: A two pound object dropped from six feet imparts twelve foot-pounds of impact energy on the part surface.

**INCHES OF MERCURY VACUUM** - A common unit of measure of the amount of vacuum obtained by a vacuum pump. One inch of mercury equals approximately 0.5 pounds per square inch of vacuum pressure.

**INTERPLY** - At ply interfaces, between plies.

**INTRAPLY** - Within a ply.

## J

**JOINT** - For repair, the means by which a patch and structure are joined together to restore load path continuity. This may be accomplished by either bonding or bolting the patch and structure together.

## K

**KEVLAR** - The registered trademark for the aramid fiber produced by the E.I. DuPont de Nemours and Company, Incorporated, and used on naval aircraft. See ARAMID FIBER.

## L

**LAMINA** - A single layer in a laminate. The layer contains fibers and matrix material in either unidirectional or woven form.

**LAMINAE** - Plural of lamina.

**LAMINATE** - A structural member made by bonding together two or more layers (plies or laminae) of material. Matrix material from each lamina is used as the bonding agent.

**LAMINATION** - The process of layup up a laminate.

**LAYUP** - The process of fabrication involving the placement of consecutive layers of materials.

## M

**MATRIX** - The material that supports the fibers in ACM. Matrix materials used in advanced composites on naval aircraft consist of epoxies, bismaleimides and polyimides.

**MATRIX CRACKS** - Resin cracks that exists at ply interfaces (interply) as well as between fibers within a ply (intraply).

**MICROCRACKING** - Microscopic cracks in the matrix material. Commonly caused by cooling down from the cure temperature at too high a rate (in excess of 5° F per minute).

**MIX RATIO** - The ratio of part A to part B to be mixed in a two part adhesive system.

**MOISTURE ABSORPTION** - The pickup of water vapor from the air by adhesives and composite materials in either the cured or uncured state. Uncured materials pickup water vapor at a higher rate than cured materials.

**MOLDLINE (INNER AND OUTER)** - The surface of a part. Inner mold line, or IML, refers to the inner surface of a part. Outer mold line or OML refers to the outer surface of the part (usually the side exposed to the airstream).

**MOLD LINE PROTRUSION** - Stick-out above the surface of a part. This stick out may interfere with airflow over the part surface or cause interference with interior mating surfaces or equipment.

**MONOLITHIC LAMINATES** - Composite laminates, typically thicker than 0.25 inch, used for structures for example wing and vertical tail skins. These skins are mechanically fastened to spar and rib substructure members.

## N

**NDI** - Nondestructive inspection. A procedure for determining if defects are present in a material, part, or assembly without permanently altering its physical or mechanical characteristics. Ultrasonic and radiographic methods are commonly used on ACM.

**NDI COUPLANT** - A material (usually a liquid) used during ultrasonic inspection as an interface to remove air gaps between the part being inspected and the ultrasonic transducer.

**NESTING** - Placing plies of woven cloth together during layup so that the fiber tows of one ply lay in the valleys of fiber tows of the adjacent ply.

**NODES** - The bonded areas along thin ribbons of material that from honeycomb core, see figure 2.

## O

**OUT-TIME** - The cumulative amount of time a film adhesive is exposed to temperatures above its storage temperature. When the allowed out-time is exceeded, the material must either be tested or discarded.



## P

**PASTE ADHESIVE** - A two part adhesive systems made up of a base resin and a curing agent. The base resin contains some type of filler material as a modifier. These adhesives require measuring and mixing of both parts before the chemical reaction which results in curing takes place.

**PEEL PLY** - Nylon or polyester woven cloth applied to the outer surfaces of a laminate during the layup process. The cloth becomes an integral part of the laminate. It provides a textured wrinkle free surface and is subsequently peeled off before bonding or painting.

**PEEL PLY IMPRESSION** - Surface texture left on the thin resin rich outer surface of a laminate following removal of peel ply.

**PLAIN WEAVE** - A weave pattern in which the fill fiber tows alternately proceed over and under warp fiber tows. This weave pattern is used primarily for flat parts.

**PLY** - See LAMINA.

**PLY ORIENTATION** - The orientation or alignment of an individual ply within a laminate with respect to a stated reference direction.

**POROSITY** - Small areas of trapped pockets of air or gas that occur in cured laminates and adhesive bondlines. These small pockets may coalesce into voids.

**POROUS RELEASE CLOTH** - Fiber glass cloth lightly coated with Teflon. The resulting cloth is porous allowing resin and gas passage without bonding to the resin or the part.

**POSITIVE PRESSURE CURE** - The process by which a repair is cured under pressure without the use of vacuum. This pressure may be applied using mechanical means or by an autoclave with the vacuum bag vented to atmosphere.

**POST-CURE** - The application of additional heat to a thermosetting material to either complete the cure or increase cross-linking of an already cured material.

**POT LIFE** - The amount of time elapsed between the time a two part resin is mixed and the time when the material hardens into an unworkable state.

**PREPREG** - Thin sheets or rolls of either unidirectional fibers or woven fibers preimpregnated with a B-staged resin. It is the basic material used in the manufacture/making of ACM laminates.

**PRIMER** - A very thin coating of diluted adhesive in the liquid state applied and cured on metallic surfaces to be bonded. They are used on metallic materials to promote adhesion, provide corrosion resistance and protect pretreated details to allow extended storage. They are not required on surfaces made from ACM.

**PULSE-ECHO ULTRASONICS** - An ultrasonic test method in which ultrasound energy is sent and received by a single search unit or transducer.

**PYROLYSIS** - Decomposition of a material because the application of heat.

## R

**RELEASE AGENT** - A material applied to layup tools or other repair tools to prevent resin from sticking to them.

**RELEASE FILM** - A thin heat resistant film used to provide a nonstick surface.

**RESIN** - An organic material used in film adhesives, paste adhesives and matrix materials.

**RESIN CONTENT** -

(1) The amount of matrix material present in prepreg. Prepreg materials typically have higher resin contents than cured laminates. The excess resin is bled during the cure process. ■

(2) The amount of matrix material present in a cured laminate. Uneven resin bleeding can result in areas in the laminate that are either resin rich or resin starved. ■

**RESIN BLEED** - See BLEEDING.

**RIBBON DIRECTION** - In honeycomb core material, the direction of the continuous foil, see figure 2.

**ROUTER SET BACK** - The distance between the cutting surface of a router bit and the edge of the router guide that interfaces with the router template.

**RUNAWAY REACTION** - A condition in which the heat liberated during the curing of a thermoset material is not able to escape (usually due to an excessive amount of material being cured) and accelerates the chemical reaction. This acceleration liberates more heat resulting in further acceleration of the reaction until an uncontrolled reaction results.

## S

**SCARF JOINT** - A flush high load transfer joint obtained by tapering the laminate from the damage cleanup hole to a prescribed outline dimension on the laminate surface. Used for depot repairs only.

**SCRIM CLOTH** - A nylon or polyester monofilament woven reinforcing cloth used to support uncured film adhesives. It is also used for flow and bond line thickness control in both films and pastes. Close knit weaves act as a corrosion barrier between bonded carbon/epoxy patches and aluminum honeycomb core.

**SECONDARY BOND** - Bonding of precured composite skins or precured repair patches to a part using adhesive.

**SEPARATOR SHEET** - Thin release film used to prevent uncured film adhesive or prepreg material from adhering to itself when rolled.

**SERVICE ENVIRONMENT** - The range of worst case operating temperature and moisture condition the part is subjected to during its service life. Materials used for manufacture/making and repair must be strong enough to resist loads applied to the part throughout this environment.

**SERVICE TEMPERATURE** - The maximum temperature the material can withstand without loss of mechanical properties. For polymer matrix composites, this condition usually is determined for moisture saturated materials. Service temperatures are typically 100(F lower than their cure temperature.

**SHEAR** - The force on a joining material (adhesive or mechanical fastener) resulting from the application of two parallel but opposite loads.

**SHELF-LIFE** - The length of time an uncured material can be stored at a specified temperature. Film adhesive shelf-life is based on a storage

temperature of 0(F or below. Shelf-life for 2 part adhesive systems is dependent on storage temperature.

**SOAK** - The phase during the cure of a thermoset material during which time the application of temperature and/or pressure is held constant. The majority of the cure is performed during this phase.

**SOLVENT** - A liquid material used for cleaning. The material dissolves solids from contaminated surfaces. It must be wiped dry before evaporation to prevent spreading the contamination over the whole surface. For bonded repairs to ACM, it is used to remove aircraft grease and other fluids before beginning the repair, and to flush contaminants from disbonds and delaminations.

**STACKING SEQUENCE** - The order in which consecutive plies of material are laid up in a composite laminate. Application of plies in the incorrect sequence can result in warping of laminates and premature failure when load is applied.

**STEP JOINT** - A flush joint obtained by machining controlled length and controlled depth steps in the laminate.

**STIFFNESS** - The ability of a material or structure to resist applied loads (bending, torsion, tension, compression, shear) without encountering excessive deflection.

**STRENGTH** - A measure of material's ability to resist applied loads (bending, torsion, tension, compression, shear) without failing.

## T

**TACK** - The slight amount of stickiness exhibited by an uncured adhesive or prepreg material. This stickiness is used to facilitate the layup process as the materials tend to form a weak bond with one another. Lack of tack can be an indicator that the material has aged excessively.

**THERMAL DAMAGE** - Damage incurred by a cured adhesive or ACM from excessive heat application. Typical damage may be the result of an aircraft fire or runaway heat blanket.

**THERMOSET MATERIAL** - A material that undergoes an irreversible chemical reaction resulting in a hard infusible solid.

## THROUGH - TRANSMISSION

**ULTRASONICS** - An ultrasonic test method in which ultrasound energy is sent by one transducer and received by a second transducer.

## U

**UNBOND** - See DISBOND.

**UNDERCURE** - A condition following the cure cycle of a thermoset material where the material has not fully cured (fully reacted). A significant reduction in strength can result.

**UNDIRECTIONAL MATERIAL** - A prepreg material or laminate with all the fibers are in the same direction. Unidirectional laminates are impractical for aircraft use. They are used as test coupons.

## V

**VACUUM BAGGING** - The process of sealing a layup under an airtight flexible sheet of bag material. Air is evacuated from the bag using a vacuum pump allowing atmospheric pressure to be applied to the layup.

**VISCOSITY** - A measure of the ability of an uncured resin to resist flow. As the age of the resin increases, ability to flow decreases and its viscosity increases.

**VOIDS** - Spaces in a cured laminate or adhesive bond line that contain air or other trapped gases instead of resin. Void areas are essentially incapable of transmitting structural loads and can result in a strength loss.

**VOLATILES** - Materials in a resin system that readily change to a vapor during the initial stages of a cure process.

## W

**WARP DIRECTION** -

(1) The direction of the tows in dry woven cloth or woven prepreg that run in the lengthwise direction, see figure 1. ■

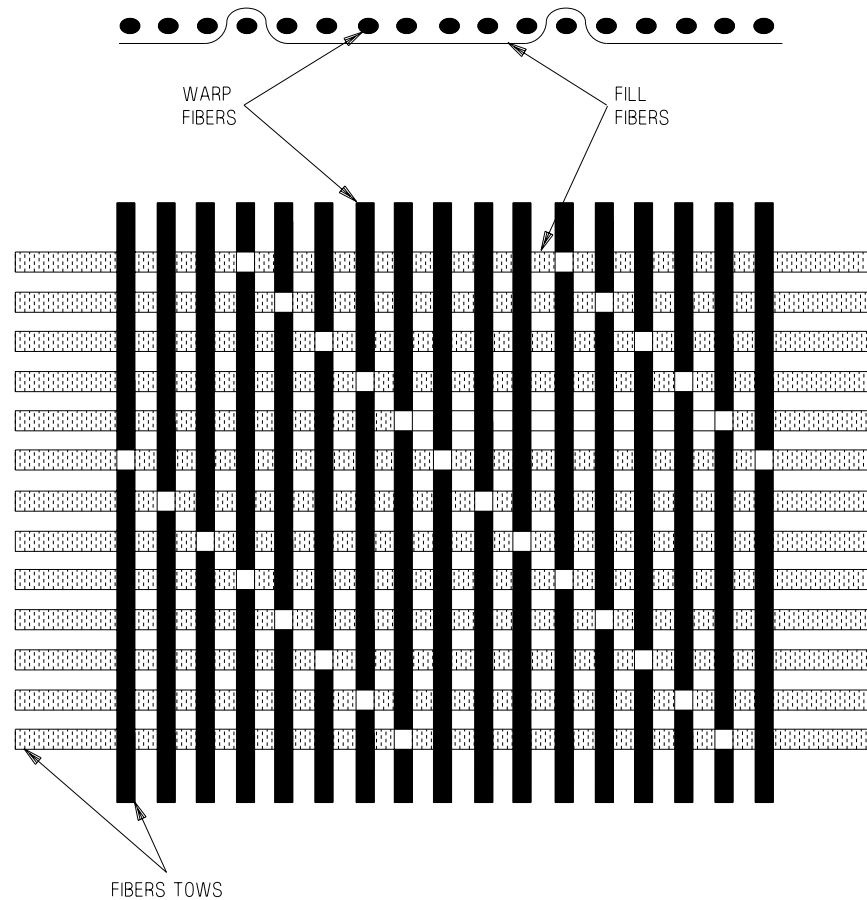
(2) The direction of the tows in a cured laminate that are oriented parallel to the primary load direction. ■

**WET LAYUP** - A repair material fabrication process in which dry woven cloth is hand impregnated with a two part liquid resin. This process is used for fabrication of substructure repair details and patches bonded to complex contoured areas. It is limited to lightly loaded areas.

**WORKING LIFE** - See POT LIFE.

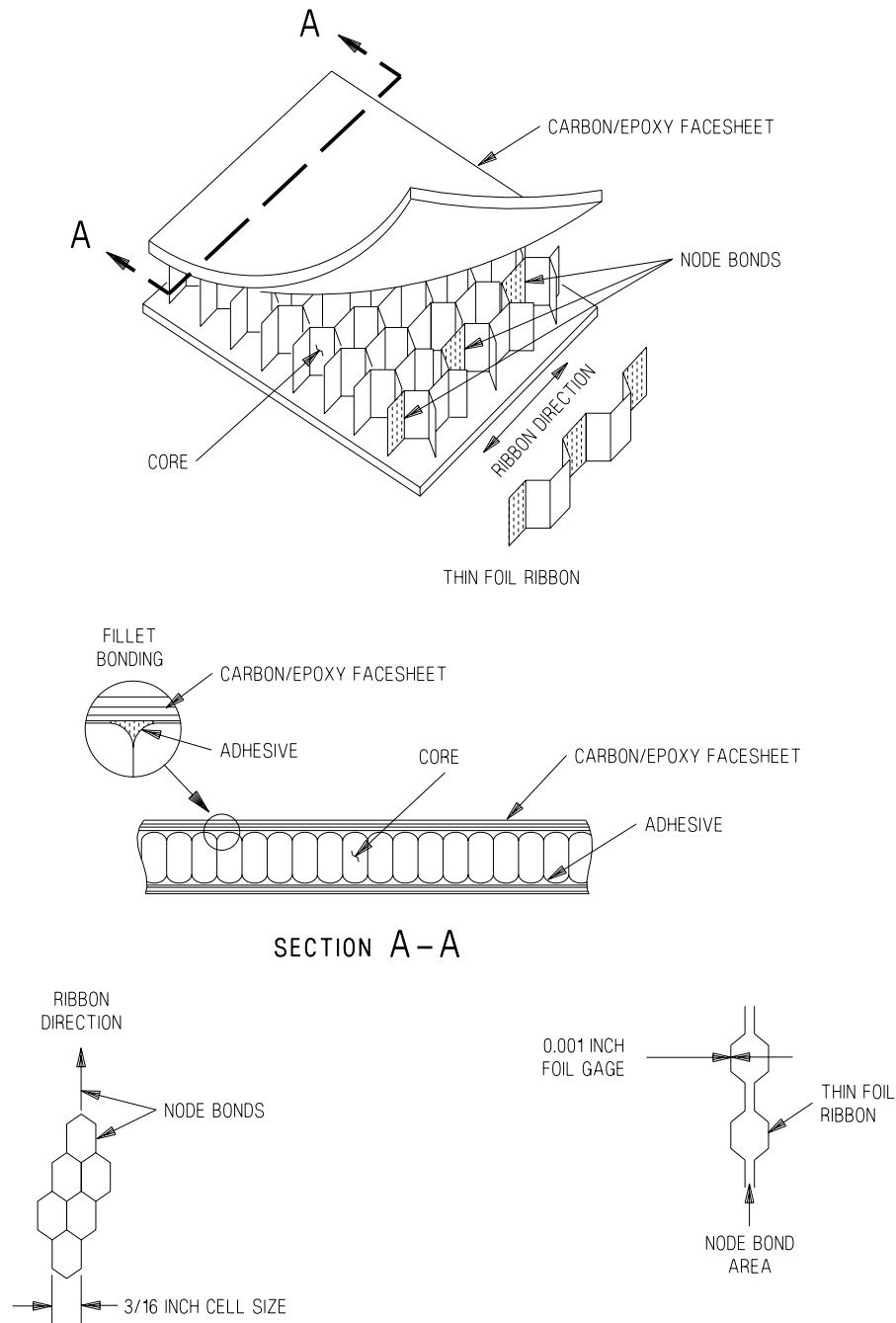
**WOVEN PREPREG** - Dry woven cloth preimpregnated with a B-staged resin system.

**WOVEN CLOTH** - Tows of carbon or aramid fibers woven into cloth. Two carbon cloth weave patterns are provided for repair applications; plain weave and eight harness satin weave. The cloth is provided dry without resin present.



PART NUMBER: W-133  
FIBER: T300 (3K TOWS)  
WEAVE: 8 HARNESS (OVER 7, UNDER 1)  
FIBER COUNT\*: 24 WARP x 23 FILL PER INCH  
THICKNESS: 0.014 INCH  
\*FIBER COUNT SPECIFIES THE NUMBER OF TOWS PER INCH.  
1 TOW CONTAINS 3,000 CARBON FIBERS.

**Figure 1. Dry Woven Carbon Weave Pattern**



DESIGNATION: 3/16-5056-.001N-3.1  
 CELL SIZE: 3/16 INCH  
 MATERIAL: 5056 ALUMINUM ALLOY  
 FOIL GAGE\*: 0.001 INCH N=NON-PERFORATED  
 DENSITY: 3.1 LBS/FT<sup>3</sup>

**Figure 2. Carbon/Epoxy Honeycomb Sandwich Assembly**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## STORAGE, PREPARATION AND HANDLING PROCEDURES FOR STRUCTURAL ADHESIVES

## Reference Material

Structure Repair General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application.....	WP 011 00
Structure Repair Typical Repairs .....	A1-F18AC-SRM-250
Heating Equipment Setup and Cure of Structural Adhesives.....	WP 004 00
General Composite Repair NAVAIR 01-1A-21 .....	NAVAIR 01-1A-21

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1. **DESCRIPTION.** This work package contains the procedures for shipping, receiving, storage, preparation, testing, and disposal of structural adhesives used for repair. Procedures for preparation of sealant materials are contained in (A1-F18AC-SRM-200, WP 011 00).

**NOTE**

Adhesive to be used in specific structure repair manual or as directed by engineering disposition.

**NOTE**

Structural adhesives used for repairs made up of liquid resins, paste adhesives, film adhesives, and foaming adhesives. The materials covered in this work package are all epoxy based resin systems.

Epoxy resin systems used for repair are provided in the uncured state and are sensitive to moisture, temperature and contamination. To prevent material degradation they must be correctly handled and stored.

a. Safety Precautions.



(1) Avoid eye or skin contact when using accelerator components, they contain reactive oxides and solvent blends which are flammable, toxic, and irritants.

(2) Avoid extended breathing of adhesive vapors, they are toxic.

(3) Satisfactory ventilation shall be provided in adhesive work area.

(4) Food or drink is prohibited in adhesive work area.

(5) Smoking is prohibited in adhesive work area.

b. Liquid Resins/Adhesives (EA956 and EA9396). These are low viscosity resins used for injecting delaminations and disbonds, for making filler compounds, and for laminating dry woven carbon or fiberglass cloth. They are two part resin systems and are kept in separate containers. Part A contains the base resin and part B the curing agent. They require accurate weighing and thorough mixing to arrive at the required structural properties. Liquid resins can be filled with chopped fibers, and/or hollow glass microspheres to make low density filler compounds or pastes. To maximize shelf life, these materials should be shipped and stored at or below 0°F.

c. Paste Adhesives (EA9321). Paste adhesives are used as filler materials, for splicing repair honeycomb core sections in position and for bonding repair patches. They use the same liquid resin discussed above but have been modified by the adhesive maker by the addition of a filler and a chemically reactive toughener. Similar liquid resins, paste adhesives require careful weighing and thorough mixing to make sure strength is not compromised. To maximize shelf life, these materials should be shipped and stored at or below 0°F.



Film and foaming adhesives used are required to have compatible cure requirements. FM300 film adhesive is to be used with FM404 foaming adhesive and FM300-2 film adhesive is to be used with FM410-1 foaming adhesive.

d. Film Adhesives (FM300 and FM300-2). Film adhesives are used for bonding repair patches. They have the base resin and curing agent pre-mixed and are cast into a thin film containing a carrier cloth. The adhesive is partly cured during the casting process resulting in a solid film. They must be shipped and stored at or below 0°F. FM300 and FM300-2 adhesive for F/A-18 repairs are provided to field activities in individually packaged 15 inch square kits. Only these kits should be used for repair. The part number for the FM300 kit is 74K000004 and the part number for the FM300-2 kit is 135027 NADEP North Island Kit Number. FM300-2 is a replacement for FM300 and has the advantage of curing at a lower temperature for a shorter time while developing the same strength.

e. Foaming Adhesives (FM404 and FM410-1). Foaming adhesives are used as a lightweight splice material for splicing honeycomb core repair sections. They are made up of a thin unsupported epoxy film which contains a blowing agent. During the initial part of the cure process, an inert gas is liberated causing an expansion or foaming action in the film. Following expansion, the adhesive is cured into a strong structural foam. They must be shipped and stored at or below 0°F. FM404 and FM410-1 are provided to field activities in individually packaged kits. Only these kits should be used for repair. The part number for the FM404 kit is 135014 NADEP North Island Kit Number. The part number for the FM410-1 kit is 135028 NADEP North Island Kit Number. FM410-1 is a replacement for FM404 and has the advantage of expanding/curing at a lower temperature for a shorter time while developing the same strength. In addition, the material is not as tacky, facilitating handling.



## 2. SHIPPING, RECEIVING, AND STORAGE, LIQUID RESINS/ADHESIVES AND PASTE ADHESIVES.

a. Shipping. These materials are in a liquid state and are supplied in two separate containers, Part A and Part B. They should be shipped at 0°F or below to maximize shelf life. Materials shipped at temperatures above 40°F are subject to degradation.

b. Receiving Inspection. Inspect containers for damage and material date at operating activity. Dispose of any punctured containers per paragraph 9. Compare the date of material with the shelf life listed in paragraph 2d. If the material has exceeded the shelf life or if the shipping/storage conditions are unknown, do material evaluation testing per paragraph 6.

### NOTE

To determine the date of for EA956, EA9396, and EA9321, inspect the first four digits of the material's lot number. The first digit is the year the material was made, the next three digits are the julian date for that year. For example: A kit of EA956 with a lot number of 5311-1 was made on Julian date 311 in the year 1995.

c. Storage. The material should be stored at or below 0°F to maximize its shelf life. Material stored above this temperature has a reduced shelf life as discussed below. Unused/unmixed part A and part B should have containers resealed and be returned to 0°F storage as soon as practical to maximize material life.

d. Shelf life. Shelf life depends on storage temperature, see figure 1, table I. Material which has exceeded its shelf life shall either be disposed of or have the material evaluation test done, per paragraph 6.

## 3. SHIPPING, RECEIVING, AND STORAGE, FILM AND FOAMING ADHESIVES.

a. Shipping. These materials in the uncured state require shipping at or below 0°F in MILB1 heat sealed, water vapor proof bags to prevent material degradation. If the material has been shipped at temperatures above 0°F, the material is

subject to degradation and requires testing. Film and foaming adhesives are shipped to operating activities in fiberboard containers containing rigid foam insulation and solid blocks of dry ice, solid CO<sub>2</sub>.

b. Receiving Inspection. Inspect the container for dry ice (solid CO<sub>2</sub>) and for the condition of individual adhesive kit package at the operating activity.

(1) If dry ice exists put the material in 0°F storage. The material is acceptable for use.

(2) If dry ice is does not exist the material may not be good. Put the material in 0°F storage and do the material evaluation test per paragraph 7 or 8.

(3) If the package is punctured or any of the heat sealed edges of the package are opened, the material is unacceptable for use and shall be disposed of per paragraph 9.

c. Storage. Store the materials at or below 0°F in MILB131 heat sealed, water vapor proof bags. If the adhesive has been removed from the bag, it must be put back in the water vapor proof bag and heat sealed using a jaw type heat sealer before returning to 0°F storage. For heat sealer, refer to NAVAIR 01-1A-21, Equipment and Tools to Perform Specialized Operation, MILB131 Bag Jaw Type Heat Sealer. DO NOT tape bag closed. If the material has been exposed to temperatures above 0°F for longer than 24 hours any time during its storage life, it may not be good and must be tested per paragraph 7 or 8.

d. Shelf Life. Film and foaming adhesive system shelf lives are based on being shipped and stored at 0°F or below. FM300, FM300-2, FM404, and FM410-1 adhesive kits have undergone thorough testing to extend their shelf lives to the below:

(1) FM300/FM300-2/FM410-1: The shelf life is 36 months from date of adhesive when stored at or below 0°F. Shelf life expiration date is marked on the adhesive kit label. Material which has exceeded the 36 month shelf life shall be disposed of per paragraph 9.

(2) FM404: The shelf life is 15 months from date of adhesive if stored at 0°F or below. Shelf life expiration date is marked on the adhesive kit label.

After a satisfactory material evaluation test per paragraph 8, the shelf life can be extended another 21 months for a maximum of 36 months from date of adhesive. Material which has exceeded the 36 month shelf life shall be disposed of per paragraph 9.

#### 4. MATERIAL PREPARATION, LIQUID RESINS/ADHESIVES, FILLER COMPOUNDS, AND PASTE ADHESIVES.

Material preparation shall be done in a controlled temperature and humidity environment, see figure 1. These adhesives are provided in separate containers. Part A contains the base resin and part B the curing agent. The material starts to cure on mixing of the two parts. It has a limited working or pot life following mixing as shown in table II. The amount of each part to mix depends on the mix ratio of the adhesive, see table II, and the amount of material required for the repair. Filler materials (for example chopped carbon fibers, milled glass fibers, or microballoons (microspheres) may be added to the adhesive to produce filler compounds. The amount of material to be added is specified in parts by weight. Determine the amount of each part to be added using the formulas below.

$$\text{Part A} = \frac{\text{Amount For Repair}}{\text{mrA} + \text{mrB} + \text{mrF}} \times \text{mrA}$$

$$\text{Part B} = \frac{\text{Amount For Repair}}{\text{mrA} + \text{mrB} + \text{mrF}} \times \text{mrB}$$

$$\text{Filler} = \frac{\text{Amount For Repair}}{\text{mrA} + \text{mrB} + \text{mrF}} \times \text{mrF}$$

where: mrA = mix ratio of part A  
 mrB = mix ratio of part B  
 mrF = mix ratio of filler material  
 (if used \*)

If filler material is not used, mrF = 0.

Figure 2 illustrates how to compute the required amounts of components to mix to get a specific amount of material for repair.

Prepare the material, see below.

#### Support Equipment Required

Part Number or Type Designation	Nomenclature
—	Screw Driver, Common
S3450	Scale, Weighting
—	Electronic Scale
MIL-STD-1202	Face Shield

#### Materials Required

Specification or Part Number	Nomenclature
UU-C-806 TYPE 2	Cup, Disposable
STYLE A CLASS 1	
GG-C-226 TYPE 1	Depressor, Tongue
E-007	Gloves, Surgeons
MILA41829	Apron, Utility



Do adhesive mixing in an environmentally controlled area only. If the repair is to be done on aircraft, do the layup of materials to minimize exposure to surrounding conditions.

To prevent excessive exotherm, mix no more than 100 grams at any one time.

Wrong mix ratio will result in reduced strength.

Do not use external heat to warm packages.

#### NOTE

Material has a limited pot life. Mix only the amount of material that can be used within the table II pot life.

a. Remove the containers of adhesive from storage. Allow material to get to room temperature before opening. Be sure material has not exceeded its shelf life.

b. Determine the amount of material required for repair. Using the above formulas and the mix

ratios from table II, compute the required amounts of each component to be mixed.

- c. Use a scale to weigh the amount of part A, part B, and filler material (if used). The operation of a balance is shown in figure 3.



Mix adhesive slowly to avoid trapping air in mixture. Introduction of an excessive amount of air into the adhesive mixture will result in excessive porosity and reduced strength.

Not enough mixing will result in reduced strength.

- d. Using a tongue depressor, mix the parts together thoroughly being careful to minimize the amount of air introduced into the mixture during mixing. The adhesive starts to cure when mixed. Note the time part A and part B were mixed together. Start timing immediately after mixing to determine adhesive pot life.

**5. MATERIAL PREPARATION, FILM AND FOAMING ADHESIVES.** Material preparation shall be done in a controlled temperature and humidity environment, see figure 1. Film and foaming adhesives stored at 0°F must be allowed to warm to room temperature before use. Opening the sealed bag before the material is at room temperature will result in the uncured adhesive absorbing atmospheric moisture while it is thawing to room temperature. Absorbed moisture will result in excessive bond line porosity and reduced strength following cure. Adhesive exposure time above 0°F is limited to 24 hours. Maintain an adhesive out time log as shown in figure 4 to keep track of adhesive exposure time. Prepare the material, see below.

## Support Equipment Required

Part Number or Type Designation	Nomenclature
GGG-S-00278 TY1CLIDESTA	Shears, Straight Trimmers

## Materials Required

Specification or Part Number	Nomenclature
MIL-G-3866 TYPE 1	Gloves, cotton



Do adhesive preparation in an environmentally controlled area only. If the repair is to be done on aircraft, do the layup of materials to minimize exposure to surrounding conditions.

- a. Remove material from 0°F storage. Inspect the date on the adhesive kit to make sure the adhesive shelf life has not expired. Note time adhesive was removed from 0°F storage and enter on adhesive out time log, see figure 4. Minimize time of adhesive exposure to temperatures above 0°F.



Do not use external heat to warm packages.

- b. Allow adhesive to warm to room temperature a minimum of 2 hours before opening sealed bag.



Wear clean cotton gloves to prevent contamination as result of skin oils when handling adhesive materials.

**NOTE**

FM404 foaming adhesive has a very narrow temperature band for handling. At subfreezing temperatures the material breaks into small pieces. At temperatures above 40°F it becomes extremely tacky. The material is most workable at 40°F. It may be reinserted into the freezer momentarily to get the material into a workable range.

- c. After the material has is at temperature, open sealed bag and remove adhesive.
- d. Cut adhesive as required to do the repair.

**NOTE**

If adhesive is exposed to temperatures above 0°F for longer than 24 hours, must be tested before use.

- e. Note time adhesive is returned to 0°F. Determine cumulative time of adhesive exposure above 0°F and enter on out time log. Put unused adhesive in its sealed bag along with out time log. Press the bag flat to remove air and reheal seal the bag using heat sealer.

## 6. MATERIAL EVALUATION TESTING FOR LIQUID RESINS AND PASTE ADHESIVES.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
SK340-00205, NADEP NI, Cage No. 91145	Vertical Flow Tester
S3450	Scale, Weighting
—	Electronic Scale
—	Stopwatch

### Materials Required

**NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
UU-C-806 TYPE 2 STYLE A CLASS 1	Cup, Disposable
GG-D-226 TYPE 1	Depressor, Tongue
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning
D 1153	Methyl Isobutyl Ketone, Analyzed Reagent
E-007	Gloves, Surgeons
MIL-STD-1202	Face Shield
MILA41829	Apron, Utility

- a. Remove the part A container of adhesive from storage. Allow material to get to room temperature before opening.

- b. Using the scale and mixing cup, weigh out 20 grams of part A from the container.

**NOTE**

The test must be done within the operating limits shown in figure 1.

- c. Setup the vertical flow test fixture, see figure 5. Solvent clean the face of the fixture. Locate the vertical flow test fixture on a level surface with the front face up and the plunger depressed to the limit of its travel.

**NOTE**

When testing EA9321 adhesive make sure that the washer is not incorporated in the vertical flow tester. The washer must be incorporated only when testing of EA956 and EA9396 adhesives is done.

- d. Put the part A in the cavity. Be sure air pockets do not exist in the cavity by probing with the tongue depressor. Level the part A flush with the surface of the front face using the tongue depressor.

e. Carefully clean around the front face using the spatula and cheesecloth or rymple cloth to remove any excess adhesive.

f. Put the vertical flow fixture in the vertical position and push the plunger until the nut (and washer if applicable) is flush with the back face of the fixture allowing the adhesive to flow down the front face. Simultaneously start timing using the stop watch.

g. Record the time when the part A first passes the 2 or 3 inch mark. Do two tests per batch of adhesive and average the time.

h. If the time to get to the 2 or 3 inch mark is equal to or less than the value listed in figure 1, table III, then the adhesive is acceptable for use. If the time to get to the 2 or 3 inch mark is greater than the value listed in table III, dispose of the adhesive per paragraph 9.

i. Disassemble and thoroughly clean the vertical flow test fixture after each use using solvent and cheesecloth or rymple cloth. Make sure no residual adhesive is left in the cavity or on the front face of the fixture.

## 7. MATERIAL EVALUATION TESTING FOR FILM ADHESIVES, FM300 AND FM300-2.

The material will be tested for flow.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
4230-109	Heat Blanket
74D110165-1001	Repair Set,
Applicable Repair Set Equipment:	Temperature/Vacuum Control, Composite Structure
74D110165-2001	Temperature Control Assembly
74D110165-2003	Vacuum Control Assembly
74D110165-2005	Accessory Case
74D111270-1001	Connector Assembly
74D111271-1001	Connector Assembly
74D111272-1001	Gage Assembly
74D111268-1001	Hose Assembly
74D111252-1001	Cable Assembly
74D111252-1003	Cable Assembly

### Support Equipment Required (Continued)

Part Number or Type Designation	Nomenclature
74D111252-1005	Cable Assembly
74D111252-1007	Cable Assembly
74D111252-1009	Cable Assembly
74D111252-1011	Temperature Sensor Assembly
GGG-K-00450	Knife, Craftman's
TY1ST2ST3ST4	
HSPG	Sealer Iron, Elect

### Materials Required

Specification or Part Number	Nomenclature
MIL-G-3866 TYPE 1	Gloves, Cotton
QQ-A-250/14	0.063 Thick Aluminum Sheet
QQ-A-250	0.25 Thick Aluminum Plate
855 1 IN	Tape, Pressure Sensitive
MILC9084TY3CL2	Cloth, Satin (120 Fiberglass)
Available in Adhesive Kit	Mylar Sheet, 0.005 Thick
MS20995NC32	Lockwire, 0.032 Diameter
135040-1	Vacuum Bag Materials Kit

### NOTE

Vacuum bag repair materials kit (135040-1) contains all materials listed for doing vacuum bag repairs.

a. Fabricate a 2.00 diameter circular template from 0.063 thick aluminum sheet.

b. Fabricate a 12 inch by 12 inch upper layup tool and a 16 inch by 16 inch lower layup tool from 0.25 thick aluminum. Inspect the flatness of the layup tools using a 12 inch straight edge. The tools must be flat to make sure uniform pressure is applied during the test.



c. Tape a thermocouple to the center of the lower surface of the lower layup tool using high temperature tape.

d. Put the lower layup tool on 10-20 layers of fiberglass cloth for insulation purposes. The glass cloth should be at least 2 inches larger than the layup tool.

e. Remove adhesive kit from freezer and allow to thaw for a minimum of 2 hours before opening sealed bag.

f. Cut one 2.00 diameter disk of adhesive from the material in question using the template fabricated above and a knife. Reinstall adhesive in MILB131 bag per paragraph 5e and return to 0°F storage.

g. Remove the release material from the adhesive disk and sandwich the disk between 2 pieces of 12 inch square mylar film. Locate the disk near the center of the mylar. Wear cotton gloves when handling adhesive. It is essential to the test results that only the specified mylar film be used.

h. Center the mylar sheets containing the adhesive disk on the upper surface of the lower layup tool.

i. Center the upper layup tool on the lower layup tool over the mylar. Tape the upper layup tool in position using high temperature tape.

j. Tape a thermocouple on top of the upper layup tool near the center of the tool using high temperature tape.

k. Center a heat blanket on top of the upper layup tool. Apply 4 layers of style 120 fiberglass cloth on top of the heat blanket extending past the upper layup tool on the lower layup tool surface.

l. Apply vacuum bag sealant, vacuum connectors and vacuum bag material to the layup per WP 004 00. Do not use copper sheet. Connect temperature/vacuum controller to the heat blanket and vacuum connectors per WP 004 00.

m. Operate the temperature/vacuum controller per WP 004 00.

n. Apply a minimum of 20 inches of mercury vacuum to the vacuum bag. If the vacuum pressure (as indicated by the vacuum gage) drops below 20

inches of mercury during the flow test, abort the test and repeat using a new disk of adhesive and new mylars.

o. Use the thermocouple located on top of the upper layup tool (underneath heat blanket) for heat blanket control. Use the thermocouple located on the lower layup tool lower surface for monitoring temperature.

p. Cover the layup with multiple layers of style 120 fiberglass cloth for insulation purposes.

q. Set rise rate to 6°F per minute and cure temperature at 365°F for FM300 or 260°F for FM300-2.

r. Set cure timer for 1 hour for FM300 or 2 hours for FM300-2 and to start cure cycle.

s. Monitor temperature during rise and cure. Be sure monitoring thermocouple on lower layup tool lower surface attains a temperature of at least 330°F for FM300 or 230°F for FM300-2. Adjust controller to get this temperature. Do not exceed a set point of 375°F for FM300 or 270°F for FM300-2. If lower surface does not get to 330°F with a 375°F setpoint for FM300 or 230°F with a 270°F setpoint for FM300-2, abort test and repeat using new adhesive disk and mylars. More insulation or a larger heat blanket may be required.

t. After the hold at temperature, cool to room temperature as rapidly as possible.

u. Remove mylars containing adhesive disk from layup.

v. Cut a piece of lockwire, 11 inches in length.

w. Tape one end of lockwire to the adhesive flow area on the mylar. Apply the wire to the perimeter of the adhesive flow area and tape at 1 inch intervals to simplify application.

x. If the wire does not touch or overlap, the material is acceptable for use. If the material touches or overlaps, the material is unacceptable for use. Dispose of per paragraph 9.

**8. MATERIAL EVALUATION TESTING FOR FOAMING ADHESIVES, FM404 AND FM410-1.** The material will be tested for expansion.

**Support Equipment Required****Part Number or  
Type Designation****Nomenclature**

74D110165-1001

Repair Set,  
Temperature/Vacuum  
Control, Composite  
Structure

■ GGG-K-00450

Knife, Craftsman

TY1ST2ST3ST4

—

Micrometer

—

Air Circulating Oven  
with 350°F  
Capability**Materials Required****Part Number****Nomenclature**

855 1 IN

Tape, Pressure  
Sensitive

QQ-A-250/14

0.063 Thick Aluminum  
Sheet

■ Release All 30

Release Liquid

a. Remove foaming adhesive kit from freezer and allow to thaw for a minimum of 2 hours before opening sealed bag.

b. Cut three 1.5 inch diameter disks of adhesive from the foaming adhesive material in question using a knife while the foaming adhesive is near 40°F. Reinstall adhesive in MILB131 bag using sealer iron and return to 0°F storage.

c. Refreeze specimens to below 0°F to make sure correct thickness measurements are made.

d. Measure the thickness of the specimens to the nearest 0.001 inch using a micrometer with the parting liners intact and while the specimens are near 0°F. Subtract parting liner thicknesses to get the unexpanded foam specimen thickness. Unexpanded specimen thickness should be approximately 0.030 inch for FM404 and 0.050 inch for FM410-1.

Apply release liquid to aluminum sheet outside of environmentally controlled area where bond operations are done.

e. Apply two cross coats of release liquid on aluminum sheet. Allow to set at room temperature for 30 minutes. Cure release liquid at 200°F for 1 hour in an oven.

f. Put specimens on an aluminum sheet that previously has had release agent applied and cured. Tape a thermocouple to the sheet to monitor the temperature during expansion of the specimens. Hook up the thermocouple to the temperature/vacuum controller.

g. Put the aluminum sheet containing the test specimens and the thermocouple in an air circulating oven at ambient temperature.

h. FM404 - Heat the oven to 350±10°F at 2 to 5°F/min and maintain for 1 hour. Make sure the aluminum sheet gets to a minimum of 340°F.

i. FM410-1 - Heat the oven to 245±15°F at 2 to 5°F/min and maintain for 2 hours. Make sure the aluminum sheet gets to a minimum of 230°F.

j. After hold, allow to cool to below 100°F and remove from oven. Remove specimens from aluminum sheet.

k. Measure the thickness of the cured specimens using a micrometer. Get expanded foam thickness by averaging 5 thickness measurements per specimen.

l. Determine foam expansion by dividing the unexpanded foam thickness determined in paragraph 8d into the expanded foam thickness determined in paragraph 8k. Record the results as "times" the original thickness. Average the results of the three specimens.

m. If the expansion is 4-6 times the initial thickness for FM404 and 2.5 to 4 times the initial thickness for FM410-1, the material is acceptable for use. If the average expansion is not within these limits, the material is unacceptable and must be discarded per paragraph 9.

**9. DISPOSAL OF MATERIAL.** In most cases, cured composite materials, cured adhesive

materials, and dry woven carbon cloth may be disposed of as nonhazardous material. However, contact the local environmental office for disposal procedures as local hazardous material disposal instructions take precedence. Do not incinerate carbon fiber composite materials. Uncured

composite materials and adhesives (including gloves, wipers, mixing cups, and so forth; that contain any amount of uncured material) must be disposed of as hazardous waste per local hazardous waste disposal procedures.

**Table 1. Liquid Resin/Paste Adhesive Shelf Life**

MATERIAL	90°F	77°F	40°F	0°F
EA956/EA9321 PART A	1 Month	3 Months	12 Months	24 Months
EA956/EA9321 PART B	12 Month	12 Months	18 Months	24 Months
EA9396 PART A	6 Month	12 Months	18 Months	24 Months
EA9396 PART B	12 Month	12 Months	18 Months	24 Months

**Table 2. Mix Ratios and Pot Life for Two Part Adhesive Compounds**

(Parts by Weight)

ADHESIVE	PART A	PART B	POT LIFE*
EA956	100	58	40 Minutes
EA9396	100	30	120 Minutes
EA9321	100	50	40 Minutes

\*The times shown are for 75°F, at 90°F, they should be reduced by 50%.

**Table 3. Vertical Flow Test Limits** 1

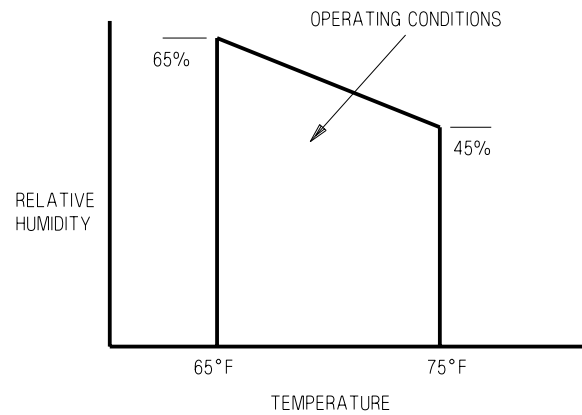
ADHESIVE <span style="border: 1px solid black; padding: 0 5px;">2</span>	TIME TO 2 INCHES MARK	TIME TO 3 INCHES MARK
EA9321	8 Minutes	Not Applicable
EA956	Not Applicable	3 Minutes
EA9396	Not Applicable	5 Minutes

**NOTES**

1 If the vertical flow time exceeds the number in this table, the material is unacceptable for use.

2 Test part A only.





ADA790-86-1-040

**Figure 1. Temperature and Humidity Operating Environment for Adhesive Preparation**

EXAMPLE 1: 25 GRAMS OF EA956 IS REQUIRED FOR REPAIR. THE MIX RATIO FOR EA956 IS 100 PARTS A TO 58 PARTS B.

$$\text{PART A} = \frac{25 \text{ GRAMS}}{100 + 58} \times 100 = 15.8 \text{ GRAMS}$$

$$\text{PART B} = \frac{25 \text{ GRAMS}}{100 + 58} \times 58 = 9.2 \text{ GRAMS}$$

$$\text{TOTAL} = 25.0 \text{ GRAMS}$$

COMBINE 15.8 GRAMS OF PART A, AND 9.2 GRAMS OF PART B TO OBTAIN 25 GRAMS OF MIXED MATERIAL.

EXAMPLE 2: 80 GRAMS OF EA9321 IS REQUIRED FOR REPAIR. THE MIX RATIO FOR EA9321 IS 100 PARTS A TO 50 PARTS B.

$$\text{PART A} = \frac{80 \text{ GRAMS}}{100 + 50} \times 100 = 53.3 \text{ GRAMS}$$

$$\text{PART B} = \frac{80 \text{ GRAMS}}{100 + 50} \times 50 = 26.7 \text{ GRAMS}$$

$$\text{TOTAL} = 80.0 \text{ GRAMS}$$

COMBINE 53.3 GRAMS OF PART A, AND 26.7 GRAMS OF PART B TO OBTAIN 80 GRAMS OF MIXED MATERIAL.

EXAMPLE 3: 60 GRAMS OF EA956 BASED SYNTACTIC FOAM IS REQUIRED AS A LOW DENSITY CORE FILLER. THE MIX RATIO FOR THE SYNTACTIC FOAM IS 100 PARTS A, 58 PARTS B, 18 PARTS MILLED GLASS AND 16 PARTS GLASS MICRO SPHERES. THE TOTAL MIXTURE IS  $100 + 58 + 18 + 16 = 192$ .

$$\text{PART A} = \frac{60 \text{ GRAMS}}{192} \times 100 = 31.3 \text{ GRAMS}$$

$$\text{PART B} = \frac{60 \text{ GRAMS}}{192} \times 58 = 18.1 \text{ GRAMS}$$

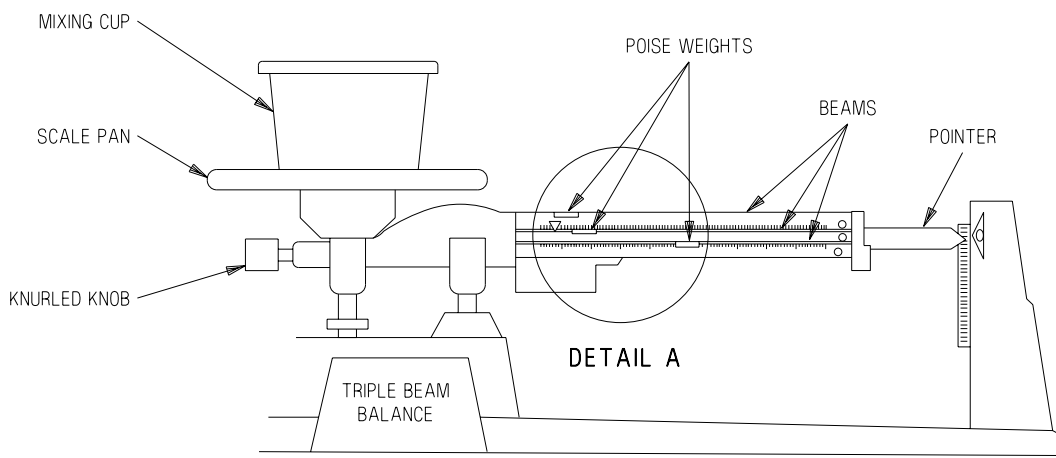
$$\text{MILLED GLASS} = \frac{60 \text{ GRAMS}}{192} \times 18 = 5.6 \text{ GRAMS}$$

$$\text{MICRO SPHERES} = \frac{60 \text{ GRAMS}}{192} \times 16 = 5.0 \text{ GRAMS}$$

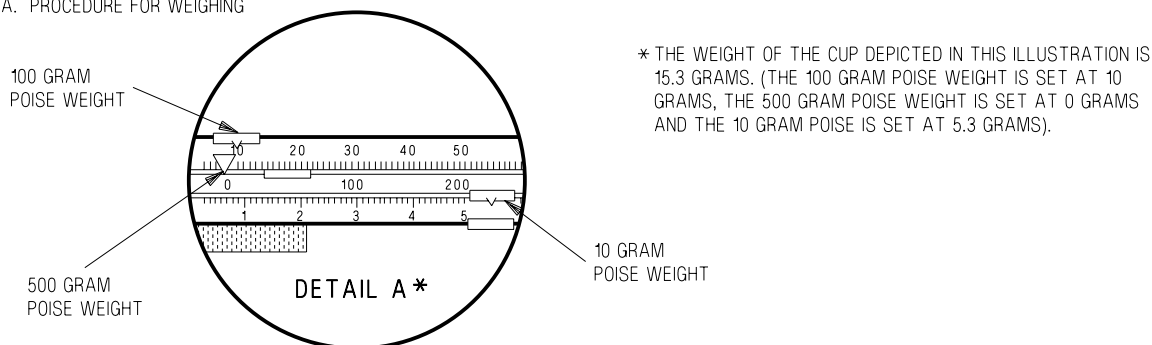
$$\text{TOTAL} = 60.0 \text{ GRAMS}$$

COMBINE 31.3 GRAMS OF PART A, AND 18.1 GRAMS OF PART B, 5.6 GRAMS OF MILLED GLASS AND 5 GRAMS OF GLASS MICRO SPHERES TO OBTAIN 60 GRAMS OF MIXED MATERIAL.

**Figure 2. Examples for Preparing Two Part Adhesives and Filler Compounds**

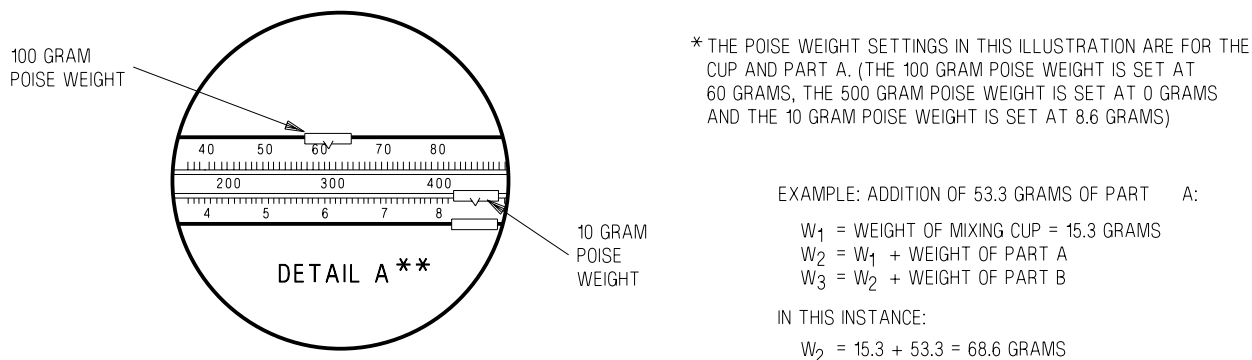


## A. PROCEDURE FOR WEIGHING



1. ALL POISE WEIGHTS SHOULD BE IN ZERO POSITION AND THE POINTER SHOULD BE AT ZERO.
2. PLACE THE CUP ON THE SCALE PAN.
3. ADJUST THE POISE WEIGHTS TO THE POSITION WHICH WILL BRING THE POINTER TO REST AT ZERO. (IF POINTER DROPS BELOW ZERO, MOVE THE POISE WEIGHT BACK UNTIL THE POINTER IS AGAIN AT ZERO).
4. THE WEIGHT OF THE CUP IS THE SUM OF THE VALUES OF ALL POISE WEIGHT POSITIONS READ DIRECTLY FROM THE GRADUATED BEAMS.

## B. USE OF BALANCE TO ADD CORRECT AMOUNT OF PART A OR PART B TO MIXING CUP



1. SET POISE WEIGHTS ON RESPECTIVE BEAMS TO CORRESPOND TO  $W_2$  (IF PART A IS BEING ADDED) OR  $W_3$  (IF PART B IS BEING ADDED).
2. ADD MATERIAL TO THE MIXING CUP UNTIL POINTER CENTERS AT ZERO.
3. THE CORRECT AMOUNT OF PART A (OR PART B) IS NOW IN THE MIXING CUP.

**Figure 3. Use of Triple Beam Balance With Two Part Adhesives**

ADHESIVE OUT-TIME LOG

NSN/PART NO: \_\_\_\_\_  
PRODUCTION DESIGNATION: \_\_\_\_\_

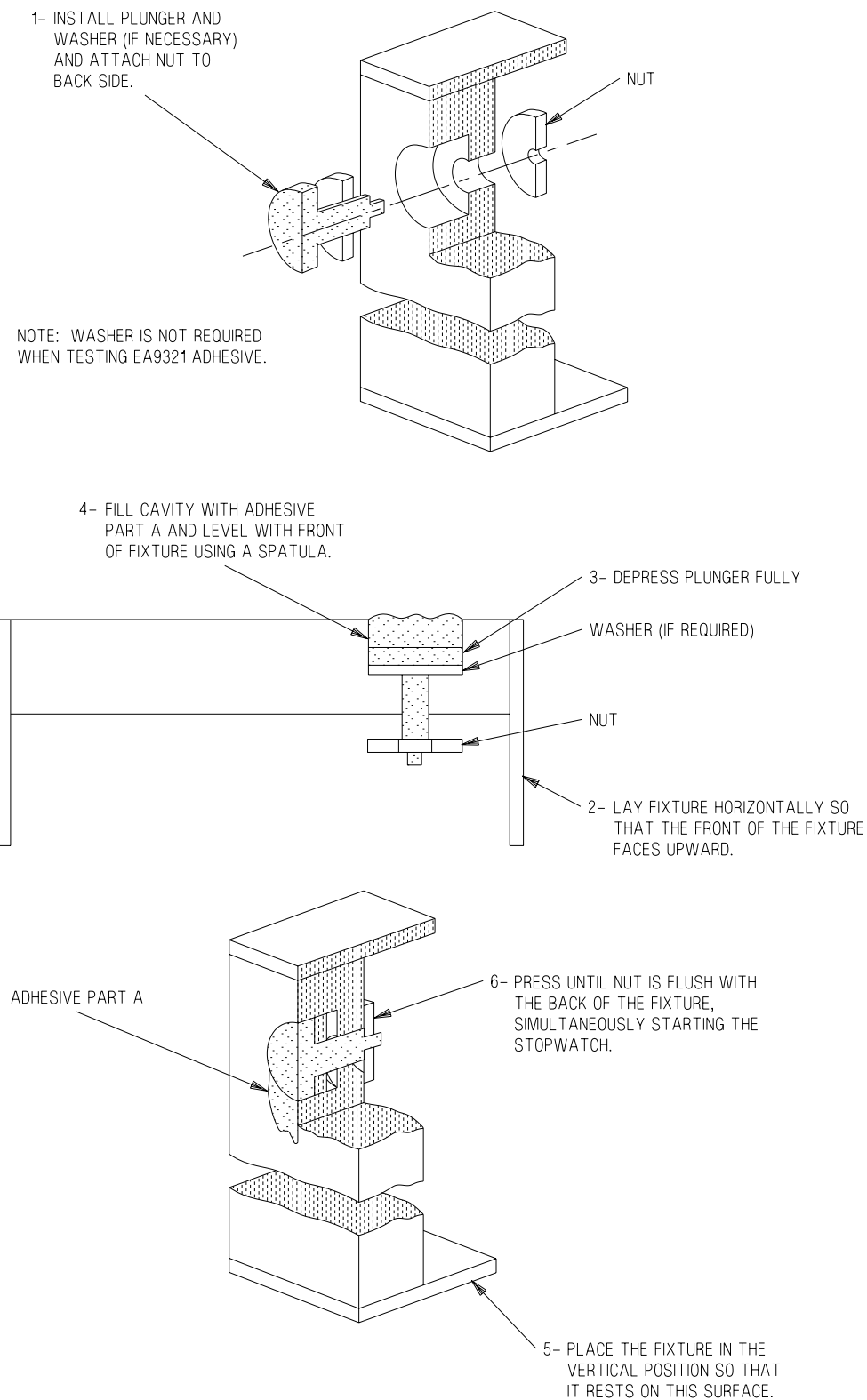
LOT NO: \_\_\_\_\_

KIT NO: \_\_\_\_\_

EXPOSURE TIME

DATE	TIME OUT	DATE	TIME IN	TOTAL HOURS OUT	CUMULATIVE TOTAL HOURS OUT
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Figure 4. Adhesive Out Time Log



**Figure 5. SK340-00205 Vertical Flow Test Fixture Assembly and Operation**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## HEATING EQUIPMENT SETUP AND CURE OF STRUCTURAL ADHESIVES

## Reference Material

Structure Repair/General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application .....	WP 011 00
Structure Repair/Typical Repairs .....	A1-F18AC-SRM-250
Carbon Epoxy and Titanium Foil Patch Fabrication .....	WP 006 00
Aluminum, Carbon Epoxy and Titanium Patch Installation and Removal .....	WP 007 00
General Composite Repair .....	NAVAIR 01-1A-21
Temperature-Vacuum Control Repair Set .....	NAVAIR 17-1-131

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## Record of Applicable Technical Directives

None

## 1. DESCRIPTION.

2. This work package contains procedures for curing EA956 A/B, EA9321 A/B, EA9396 A/B, FM300, FM300-2, FM404 and FM 410-1 adhesives used for typical repairs. Structural adhesive cure cycles are summarized in figure 1. Procedures for curing sealant materials are contained in (A1-F18AC-SRM-200, WP 011 00).

**NOTE**

Heat/Vacuum Blanket, AM-D-O-MDA1S1-101, -103, -105, and -107 has been removed and should not be used for bonded repairs.

## 3. CURING OF EA956 A/B AND EA9396 A/B LIQUID ADHESIVE AND EA9321 A/B PASTE ADHESIVES.

4. EA956 A/B, EA9321 A/B liquid adhesive, or EA9396 A/B adhesives are cured to full strength by air cure or heat cure methods.

**NOTE**

If room temperature (greater than 75° F) can not be maintained during cure cycle, a heat cure method of paragraph 6 should be used.

5. **AIR CURE METHOD.** Allow to cure at room temperature (greater than 75° F) and for 5 days.

6. **HEAT CURE METHOD.** Procedures to cure EA956 A/B, EA9396 A/B, and EA9321 A/B adhesives using 4230-103, -109, and MDA151-002 heat blankets are listed below.

7. **EA956 A/B, EA9396 A/B Liquid Adhesive, or EA9321 A/B Paste Adhesive Using 4230-103, -109, and MDA151-002 Heat Blankets.** See figure 2.

**Support Equipment Required**

Part Number or Type Designation	Nomenclature
4230-103	Heat Blanket
4230-109	Heat Blanket

**Support Equipment Required  
(Continued)**

Part Number or Type Designation	Nomenclature
MDA151-002	Heat Blanket
74D110165-1001	Repair Set,
Applicable Repair Set Equipment	Temperature/ Vacuum Control, Composite Structure
74D110165-2001	Temperature Control Assembly
74D110165-2003	Vacuum Control Assembly
74D110165-2005	Accessory Case
74D111270-1001	Connector Assembly
74D111271-1001	Connector Assembly
74D111272-1001	Gage Assembly
74D111268-1001	Hose Assembly
74D111252-1001	Cable Assembly
74D111252-1003	Cable Assembly
74D111252-1005	Cable Assembly
74D111252-1007	Cable Assembly
74D111252-1009	Cable Assembly
74D111252-1011	Temperature Sensor Assembly

**Materials Required**

Specification or Part Number	Nomenclature
WRIGHTLON 7400	Plastic Sheet (Vacuum Bag Film)
9151-0-500	Tape, Adhesive, Rubber
TEMP-R-GLAS6TB	Cloth, Coated
855 1 IN	Pressure Sensitive Tape
100SG30TR	Plastic Sheet (Non- porous release film)
QQC576SOFT	Copper Sheet, 0.020
ANNEALED	Inch Thick
0-020X36X48	
MILC9084TY8CL2	Cloth, Satin (181 Fiberglass)
135040-1	Vacuum Bag Materials Kit
—	Release Fabric (Porous Release)



## NOTE

Alternate USN Temperature/vacuum control unit, 1935AS100-1, can be used for this repair.

a. If alternate control unit is being used, operate the unit per NAVAIR 17-1-131 with exceptions noted below.

(1) Select heat blanket this work package.

(2) Use thermocouples per this work package. Adjust controller to get all thermocouples within required temperature range during ramp-up and cure, see figure 1.

## NOTE

This procedure should be done after adhesive and patch (if applicable) assembly procedures of WP 007 00 are completed.

b. If a patch is bonded with EA9321 adhesive position a temperature sensor assembly (6) (thermocouple) directly on the patch and tape in position with pressure sensitive tape.

## NOTE

One control thermocouple (6) and a minimum of 2 monitoring thermocouples (6) are required for control of 4230-103, -109, and MDA151-002 heat blankets (7).

Control thermocouple should be located in the middle of copper sheet and heat blanket. Monitoring thermocouples should be positioned 0.25 to 0.50 from the edge of the repair on the surface of the part.

Vacuum bag repair materials kit (135040-1) contains all materials for doing vacuum bag repairs.

c. Cover repair with porous release fabric 3 inches past periphery of repair area. Refer to NAVAIR 01-1A-21, Section V, Vacuum Bag Repair Materials Kit 135040-1 table.

d. Position one layer of plastic release sheet over repair. Cut sheet the same size as release

fabric. Tape edges of sheet with pressure sensitive tape.

e. Cut a piece of 0.020 thick copper sheet as large as the heat blanket (7). Center copper sheet over layer of plastic release sheet.

## NOTE

Plastic release sheet prevents adhesive from bonding to the copper sheet.

f. For EA956 and EA9396 adhesive repairs position temperature sensor assembly (6) on top of copper sheet near center of repair. Tape in position with pressure sensitive tape.

g. Center heat blanket (7) over copper sheet. A minimum of 2 inches between heat blanket and the edge of the repair or the edge of the patch (if applicable) is required.

h. Cover heat blanket (7) with two layers of satin breather cloth.

i. Position bases of connector assemblies (8) and (10) on satin cloth at one end of heat blanket (7).

j. Apply vacuum bag tape around outside of layup. Apply extra vacuum bag tape around temperature sensor assembly (6) leads and heat blanket cable assembly (12).

k. Position WRIGHTLON 7400 plastic sheet (vacuum bag) over layup and press into vacuum bag tape to form a vacuum bag. Cover heat blanket with insulation.

l. Make small slits in plastic sheet over each vacuum connector assembly base (8) and (10) and attach quick disconnects to bases.

m. Connect repair set, 74D110165, to repair arrangement per substeps below.

(1) Connect cable assembly (1) to temperature control assembly (2) and facility power.

(2) Connect cable assembly (14) to temperature control assembly (2) and vacuum control assembly (4).

(3) Connect cable assembly (13) to temperature control assembly (2) and cable assembly (12).

(4) Connect branches of cable assembly (12) to heat blanket (7) and temperature sensor assembly (6).

(5) Connect cable assembly (11) to temperature control assembly (2) and sensor branches of cable assembly (11) to temperature sensor assembly (6).

(6) Connect hose assembly (5) to vacuum control assembly (4) and connector assembly (10).

(7) Connect gage assembly (9) to connector assembly (8).

(8) Set MASTER POWER switch on temperature control assembly (2) to ON. Do lamp test, battery test, and overtemp alarm test. After test, set MASTER POWER switch to OFF. Set MASTER POWER, CONTROLLER POWER, INDICATOR POWER, TIMER POWER, AND PRINTER POWER switches to ON position.

(9) On temperature control assembly (2), do substeps below:

(a) Set cure temperature on controller module(s) to 190°, see figure 2.

(b) Set controller module(s) for rise rate of 4°F per minute.

(c) Set cure time on timer module for 1 hour.

(d) Select channel to be displayed on indicator module(s).

(e) Select temperature sensor input to be recorded with printer source switch. Record highest bond line temperature.

### NOTE

Do not set temperature control module ON before step (11) is completed.

(10) Set POWER switch on vacuum control assembly (4) to ON. Pull vacuum of 20 to 29 inches of mercury. Smooth the wrinkles in the bag as air is evacuated while continuing to work the bagging film into the vacuum bag sealant. Inspect for audible leaks and repair them as required. The vacuum bag gage must read at least 20 inches of mercury. If a

minimum of 20 inches of mercury cannot be obtained and/or audible leaks cannot be eliminated, apply new bagging materials to the repair.

(11) Precure EA956 A/B, EA9396 A/B or EA9321 A/B, adhesive for 2 hours at room temperature maintaining vacuum pressure of 20 to 29 inches of mercury during cure.

(12) On temperature control assembly (2), set MASTER POWER switch to ON.

(13) Monitor all thermocouples during ramp-up to cure temperature to satisfy temperature tolerances required per figure 1. Record all thermocouple readings manually at each fifteen minutes during the cure process. Note control temperature and minimum/maximum monitoring thermocouples temperature for quality assurance.

(14) If the lowest monitoring thermocouple does not get to 180° the following steps should be done:

(a) Increase control thermocouple set point to upper cure cycle tolerance (200°F).

(b) Add more insulation (satin cloth) on top of the heat blanket.

(c) Terminate the repair and cool to room temperature. Repeat cure cycle using larger size heat blanket.

(d) If substeps (a) through (c) did not produce acceptable monitoring thermocouple readings (190° ±10°F) get Cognizant Field Activity (CFA) depot engineering assistance.

(15) After completion of repair, set all switches to OFF. Allow repair to cool to room temperature.

(16) Disconnect and stow: cable assemblies (1), (11), (12), (13), and (14) hose assembly (5) connector assemblies (8) and (10), gage assembly (9) temperature sensor assembly (6) and heat blanket (7).

(17) Remove layers of satin cloth, copper sheet, plastic release sheet, and porous release fabric.

n. Refer to Part Specific Work Package for next procedure.

## 8. CURING OF FM300 AND FM300-2 FILM ADHESIVES.

9. Film adhesives require heat application to complete cure.

10. **FM300 or FM300-2 Adhesive Using 4230-103, -109, and MDA151-002 Heat Blankets.**  
See figure 2.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
4230-103	Heat Blanket
4230-109	Heat Blanket
MDA151-002	Heat Blanket
74D110165-1001	Repair Set,
Applicable Repair Set Equipment:	Temperature/Vacuum Control, Composite Structure
74D110165-2001	Temperature Control Assembly
74D110165-2005	Accessory Case
74D111252-1001	Cable Assembly
74D111252-1005	Cable Assembly
74D111252-1007	Cable Assembly
74D111252-1009	Cable Assembly
74D111252-1011	Temperature Sensor Assembly

### Materials Required

Specification or Part Number	Nomenclature
WRIGHTLON 7400	Plastic Sheet (Vacuum Bag Film)
855 1 IN	Pressure Sensitive Tape
100SG30TR	Plastic Sheet (Non-porous release film)
QQC576SOFT ANNEALED 0-020X36X48	Copper Sheet, 0.020 Inch Thick
MILC9084TY8CL2	Cloth, Satin (181 Fiberglass
135040-1	Vacuum Bag Materials Kit

### Materials Required (Continued)

Specification or Part Number	Nomenclature
—	Release Fabric (Porous Release)



It is required that film and foaming adhesives used have compatible cure requirements. FM300 film adhesive is to be used with FM404 foaming adhesive and FM300-2 film adhesive is to be used with FM410-1 foaming adhesive.

#### NOTE

This procedure should be done after adhesive and patch (if applicable) assembly procedures of WP 007 00 are completed.

Vacuum bag repair materials kit (135040-1) contains all materials for doing vacuum bag repairs.

a. Position a temperature sensor assembly (6) (thermocouple) directly on the patch and tape in position with pressure sensitive tape.

#### NOTE

One control thermocouple (6) and a minimum of 2 monitoring thermocouples (6) are required for control of 4230-103, -109, and MDA151-002 heat blankets (7).

Control thermocouple should be located in the middle of copper sheet and heat blanket. Monitoring thermocouples should be positioned 0.25 to 0.50 from the edge of the repair on the surface of the part.

b. Cover repair with porous release fabric 3 inches past periphery of repair area. Refer to NAVAIR 01-1A-21, Section V, Vacuum Bag Repair Materials Kit 135040-1 table.

c. Position one layer of plastic release sheet over repair. Cut sheet the same size as release

fabric. Tape edges of sheet with pressure sensitive tape.

d. Cut a piece of 0.020 thick copper sheet as large as the heat blanket (7). Center copper sheet over layer of plastic release sheet.

### NOTE

Plastic release sheet prevents adhesive from bonding to the copper sheet.

e. Center heat blanket (7) over copper sheet. A minimum of 2 inches between heat blanket and the edge of the patch is required.

f. Cover heat blanket (7) with two layers of satin breather cloth.

g. Position bases of connector assemblies (8) and (10) on satin cloth at one end of heat blanket (7).

h. Apply vacuum bag tape around outside of layup. Apply extra vacuum bag tape around temperature sensor assembly (6) leads and heat blanket cable assembly (12).

i. Position WRIGHTLON 7400 plastic sheet (vacuum bag) over layup and press into vacuum bag tape to form a vacuum bag. Cover heat blanket with insulation.

j. Make small slits in plastic sheet over each vacuum connector assembly base (8) and (10) and attach quick disconnects to bases.

k. Connect repair set, 74D110165, to repair arrangement per substeps below.

(1) Connect cable assembly (1) to temperature control assembly (2) and facility power.

(2) Connect cable assembly (14) to temperature control assembly (2) and vacuum control assembly (4).

(3) Connect cable assembly (13) to temperature control assembly (2) and cable assembly (12).

(4) Connect branches of cable assembly (12) to heat blanket (7) and temperature sensor assembly (6).

(5) Connect cable assembly (11) to temperature control assembly (2) and sensor branches of cable assembly (11) to temperature sensor assembly (6).

(6) Connect hose assembly (5) to vacuum control assembly (4) and connector assembly (10).

(7) Connect gage assembly (9) to connector assembly (8).

(8) Set MASTER POWER switch on temperature control assembly (2) to ON. Do lamp test, battery test, and overtemp alarm test. After test, set MASTER POWER switch to OFF. Set MASTER POWER, CONTROLLER POWER, INDICATOR POWER, TIMER POWER, AND PRINTER POWER switches to ON position.

(9) On temperature control assembly (2), do substeps below.

(a) Set cure temperature on controller module(s) to 305°F (FM300) or 245°F (FM300-2).

(b) Set controller module(s) for rise rate of 4°F per minute.



Cure temperatures in excess of 260°F can cause skin to core disbands in honeycomb sandwich structures. FM300-2 film adhesive should be used for honeycomb sandwich assembly repairs to reduce potential for damage.

(c) Set cure time on timer module for 4 hours (FM300) or 2 hours (FM300-2). See figure 1.

(d) Select channel to be displayed on indicator module(s).

(e) Select temperature sensor input to be recorded with printer source switch. Record highest bond line temperature.

(10) Set POWER switch on vacuum control assembly (4) to ON. Pull vacuum of 20 to 29 inches of mercury. Smooth the wrinkles in the bag as air is evacuated while continuing to work the bagging film into the vacuum bag sealant. Inspect for audible leaks and repair them as required. The vacuum bag gage must read at least 20 inches of mercury. If a minimum of 20 inches of mercury cannot be obtained and/or audible leaks cannot be eliminated, apply new bagging materials to the repair.

(11) Deleted.

(12) On temperature control assembly (2), set MASTER POWER switch to ON.

(13) Monitor all thermocouples during ramp-up to cure temperature to satisfy temperature tolerances required per figure 1. Record all thermocouple readings manually at each fifteen minutes during the cure process. Note control temperature and minimum/maximum monitoring thermocouples temperature for quality assurance.

(14) If the lowest monitoring thermocouple does not get to 290°F (FM300) or 230°F (FM300-2) the following steps should be done.

(a) Increase control thermocouple set point to upper cure cycle tolerance 320°F (FM300) or 260°F (FM300-2).

(b) Add more insulation (satin cloth) on top of the heat blanket.

(c) Terminate the repair and cool to room temperature. Repeat cure cycle using larger size heat blanket.

(d) If substeps (a) through (c) did not produce acceptable monitoring thermocouple readings (190° ±10°F) get Cognizant Field Activity (CFA) depot engineering assistance.

(15) After completion of repair, set all switches to OFF. Allow repair to cool to room temperature.

(16) Disconnect and stow: cable assemblies (1), (11), (12), (13), (14), hose assembly (5), connector assemblies (8), (10), gage assembly (9), temperature sensor assembly (6) and heat blanket (7).

(17) Remove layers of satin cloth, copper sheet, plastic release sheet, and porous release fabric.

1. Refer to Part Specific Work Package for next procedure.

## 11. CURING OF FM404 AND FM410-1 FOAMING ADHESIVES.

12. Foaming adhesives require heat application to expand and complete cure.



It is required that film and foaming adhesives used have compatible cure requirements. FM300 film adhesive is to be used with FM404 foaming adhesive and FM300-2 film adhesive is to be used with FM410-1 foaming adhesive.

## 13. FM404 AND FM410-1 HEAT CURE METHOD USING 4230-103, -109, AND MDA151-002 HEAT BLANKETS, POSITIVE PRESSURE CURE.

See figure 3.

## Support Equipment Required

Part Number or Type Designation	Nomenclature
4230-103	Heat Blanket
4230-109	Heat Blanket
MDA151-002	Heat Blanket
74D110165-1001	Repair Set,
Applicable Repair	Temperature/
Set Equipment:	Vacuum Control,
	Composite Structure
74D110165-2001	Temperature Control
	Assembly
74D110165-2005	Accessory Case
74D111252-1001	Cable Assembly
74D111252-1005	Cable Assembly
74D111252-1007	Cable Assembly
74D111252-1009	Cable Assembly
—	Vacuum Cleaner



**Support Equipment Required**

Part Number or Type Designation	Nomenclature
74D111252-1011	Temperature Sensor Assembly
Commercial Availability	Shot Bags

**Materials Required**

Specification or Part Number	Nomenclature
TEMP-R-GLAS6TB 855 1 IN CCCC440TY1CL1 100SG30TR	Cloth, Coated Pressure Sensitive Tape Cloth, Cheesecloth Plastic Sheet (Nonporous Release film)
QQC576SOFT ANNEALED 0-020X36X48 MILC9084TY8CL2	Copper Sheet, 0.020 Inch Thick
135040-1	Cloth, Satin (181 Fiberglass Vacuum Bag Materials Kit
—	Release Fabric (Porous Release)

**NOTE**

Alternate USN Temperature/vacuum control unit (1935AS100-1) can be used for this repair.

a. If alternate control unit is being used, operate, the unit per NAVAIR 17-1-131 with exceptions noted below.

(1) Select heat blanket per this work package.

(2) Use thermocouples per this work package. Adjust controller to get all thermocouples within required temperature range during ramp-up and cure, see figure 1.

**NOTE**

Vacuum bag repair materials kit (135040-1) contains all materials listed for doing vacuum bag repairs.

b. Cover repair with porous release fabric 3 inches past periphery of repair. Refer to NAVAIR 01-1A-21, Section V, Vacuum Bag Repair Materials Kit 135040-1 table.

c. Position one layer of plastic release sheet over repair. Cut sheet the same size as release fabric. Tape edges of sheet with pressure sensitive tape.

d. Cut a piece of 0.020 thick copper sheet as large as the heat blanket (6).

**NOTE**

Plastic release sheet prevents adhesive from bonding to the copper sheet.

e. Position temperature sensor assembly (5) on top of plastic release sheet near center of repair. Tape in position with pressure sensitive tape.

**NOTE**

One control thermocouple (5) and a minimum of 2 monitoring thermocouples (5) are required for control of 4230-103, -109, and MDA151-002 heat blankets (6).

Control thermocouple should be located in the middle of copper sheet and heat blanket. Monitoring thermocouples should be positioned 0.25 to 0.50 from the edge of the repair on the surface of the part.

f. Center 0.020 copper sheet over layer of teflon cloth.

g. Center heat blanket (6) over copper sheet and tape in position with pressure sensitive tape. A minimum of 2 inches between heat blanket and the edge of the honeycomb plug is required. Heat blankets are required on both sides on the sandwich structure if honeycomb sandwich height is greater than 1 inch.

h. Cover heat blanket (6) with two layers of satin breather cloth.

i. Apply at least 1 psi of positive pressure uniformly on heat blanket(s) using shot bags in order to maintain a contact between the heat blanket and a part.



Do not apply vacuum during cure.

j. Connect repair set (74D110165) to repair arrangement per substeps below:

(1) Connect cable assembly (1) to temperature control assembly (2) and facility power.

(2) Connect cable assembly (4) to temperature control assembly (2) and to temperature sensor assembly (5).

(3) Connect cable assembly (8) to temperature control assembly (2) and to cable assembly (7).

(4) Connect sensor branch of cable assembly (7) to temperature sensor assembly (5).

(5) Connect power branch of cable assembly (7) to heat blanket (6).

(6) Set MASTER POWER switch on temperature control assembly (2) to ON. Do lamp test, battery test, and overtemp alarm test. After test, set MASTER POWER switch to OFF. Set MASTER POWER, CONTROL POWER, INDICATOR POWER, TIMER POWER, and PRINTER POWER SWITCHES to ON position.

(7) On temperature control assembly (2), do substeps below:



Cure temperatures in excess of 260° F can cause skin to core disbonds in honeycomb sandwich structures. FM410-1 foaming adhesive should be used for honeycomb sandwich assembly repairs to reduce potential for damage.

(a) Set cure temperature on controller modules at 245° F (FM410-1) or 305° F (FM404). See figure 1.

(b) Set controller module(s) for rise rate of 4° F/min.

(c) Set cure time on timer module for 1 hour (FM404 and FM410-1)

## NOTE

Subsequent FM300-2 or FM300 patch bond sequence is required if this cure cycle is used.

(d) Select channel to be displayed on indicator module(s).

(e) Select temperature sensor input to be recorded with printer source switch. Record highest bond line temperature.

(f) On temperature control assembly (2), set MASTER POWER switch to ON.

(8) Record all thermocouple readings manually at each fifteen minute intervals during the cure process. Note control temperature and minimum/maximum monitoring thermocouples temperature for quality assurance.

(9) If the lowest monitoring thermocouple does not get to 230° (FM 410-1) or 290° F (FM 404) the following steps should be done.

(a) Increase control thermocouple set point to upper cure cycle tolerance (260° F for FM 410-1, 310° F for FM 404).

(b) Add more insulation (satin cloth) on top of the heat blanket.

(c) Terminate the repair and cool to room temperature. Repeat cure cycle using larger size heat blanket.

(d) If substeps (a) through (c) did not produce acceptable monitoring thermocouple readings per figure 1, get Cognizant Field Activity (CFA) depot engineering assistance.

(10) After cure, set all switches to OFF. Allow repair to cool to room temperature.

(11) Disconnect and stow: cable assemblies (1), (4), (7), (8), temperature sensor assembly (5), and heat blanket (6).

(12) Remove layers of satin cloth, copper sheet, plastic release sheet and porous release fabric.

(13) Vacuum clean repair area and wipe with clean dry cheesecloth.

k. Refer to Part Specific Work Package for next procedure:

#### 14. CURING OF FM410-1 FOAMING ADHESIVE USING 1935AS100-1 COMPOSITE REPAIR KIT AND VACUUM BAG, PARTIAL VACUUM CURE.

See figure 4.



It is required that film and foaming adhesives used have compatible cure requirements. FM300-2 film adhesive is to be used with FM410-1 foaming adhesive.

DO NOT use the partial vacuum cure for curing FM404 foaming adhesive. Overexpansion and significantly reduced strength will result.

If 1935AS100-1 Composite Repair Kit is not available, then the heat cure per paragraph 13 must be used.

#### Support Equipment Required

Part Number or Type Designation	Nomenclature
1935AS100-1	Composite Kit

#### Materials Required

Specification or Part Number	Nomenclature
WRIGHTLON 7400	Plastic Sheet (Vacuum Bag Film)
855 1 IN	Tape, Pressure Sensitive
CCCC440TY1CL1 100SG30TR	Cloth, Cheesecloth Plastic Sheet (Non-porous release film)
QQC576SOFT ANNEALED 0-020X36X48	Copper Sheet, 0.020 Inch Thick
MILC9084TY8CL2	Cloth, Satin (181 Fiberglass
135040-1	Vacuum Bag Materials Kits
-	Release Fabric (Porous Release)

#### NOTE

Vacuum bag repair materials kit (135040-1) contains all materials listed for doing vacuum bag repairs.

Operate 1935AS100-1 Temperature/vacuum control unit per NAVAIR 17-1-131 except as shown below.

a. Cover repair with porous release fabric 3 inches past periphery of repair. Refer to NAVAIR 01-1A-21, Section V, Vacuum Bag Repair Materials Kit 135040-1 table.

b. Position one layer of plastic release sheet over repair. Cut sheet the same size as release fabric. Tape edges of sheet with pressure sensitive tape.

c. Cut a piece of 0.020 thick copper sheet as large as the heat blanket.

#### NOTE

Plastic release sheet prevents adhesive from bonding to the copper sheet.

d. Position temperature sensor assembly (5) on top of plastic release sheet near center of repair. Tape in position with pressure sensitive tape. Adjust controller to get all thermocouples within



required temperature range during ramp-up and cure, see figure 1.

e. Center 0.020 copper sheet over layer of plastic release sheet.

f. Center heat blanket over copper sheet and tape in position with pressure sensitive tape. A minimum of 2 inches between heat blanket and the edge of the honeycomb plug is required. Heat blankets are required on both sides on the sandwich structure if honeycomb sandwich height is greater than 1 inch.

**CAUTION**

Do not apply greater than 10 inches Mercury vacuum during cure.

**NOTE**

Subsequent FM300-2 patch bond sequence is required if this cure cycle is used.

g. Operate 1935AS100-1 unit per NAVAIR 17-1-131 with exceptions noted below.

(1) Set cure temperature to 245 F.

**CAUTION**

Cure temperatures in excess of 260°F can cause skin to core disbands in honeycomb sandwich structures.

(2) Change the vacuum requirement to 5 to 10 inches of mercury. The minimum vacuum for leak inspection should be 5 inches of mercury.

(3) The vacuum gage in the vacuum bag must read between 5 and 10 inches of mercury without audible leaks during the cure process.

(4) Change the temperature for the lowest cure temperature requirements to 230°F and for the upper cure cycle temperature tolerance to 260°F.

h. Vacuum clean repair area and wipe with clean dry cheesecloth.

i. Refer to Part Specific Work Package for next procedure.

## 15. CURING OF W133/EA956 AND W133/EA9396 WET LAYUP PATCHES.

16. W133/EA956 and W133/EA9396 wet layup patches can be cured and secondarily bonded or cobonded directly on the part using heat application method described in this procedure.

17. **W133/EA956 and W133/EA9396 Using 4230-103, -109, and MDA151-002 Heat Blankets.** See figure 2.

## Support Equipment Required

Part Number or Type Designation	Nomenclature
4230-103	Heat Blanket
4230-109	Heat Blanket
MDA151-002	Heat Blanket
74D110165-1001	Repair Set,
Applicable Repair Set Equipment	Temperature/Vacuum Control, Composite Structure
74D110165-2001	Temperature Control Assembly
74D110165-2003	Vacuum Control Assembly
74D110165-2005	Accessory Case
74D111270-1001	Connector Assembly
74D111271-1001	Connector Assembly
74D111272-1001	Gage Assembly
74D111268-1001	Hose Assembly
74D111252-1001	Cable Assembly
74D111252-1003	Cable Assembly
74D111252-1005	Cable Assembly
74D111252-1007	Cable Assembly
74D111252-1009	Cable Assembly
74D111252-1011	Temperature Sensor Assembly S115/

## Materials Required

Specification or Part Number	Nomenclature
WRIGHTLON 7400	Plastic Sheet (Vacuum Bag Film)

**Materials Required (Continued)**

<b>Specification or Part Number</b>	<b>Nomenclature</b>
9151-0-500	Tape, Adhesive, Rubber
TEMP-R-GLAS6TB 855 1 IN	Cloth, Coated Tape, Pressure Sensitive
100SG30TR	Plastic Sheet (Non-porous release Film)
QQC576SOFT ANNEALED 0-020X36X48	Copper Sheet, 0.020 Inch Thick
MILC9084TY8CL2	Cloth, Satin (181 Fiberglass
135040-1	Vacuum Bag Materials Kit
—	Release Fabric (Porous Release)
MILC9084TY3CL2	Cloth, Satin (120 Fiberglass

**NOTE**

Alternate USN Temperature/vacuum control unit, 1935AS100-1, can be used for this repair.

a. If alternate control unit is being used, operate the unit per NAVAIR 17-1-131 with exceptions noted below.

(1) Select heat blanket per this work package.

(2) Use thermocouples per this work package. Adjust controller to get all thermocouples within required temperature range during ramp-up and cure, see figure 1.

**NOTE**

Vacuum bag repair materials kit (135040-1) contains all materials listed for doing vacuum bag repairs.

This procedure should be done after wet layup patch installation procedures of WP 006 00 (precured wet layup patch) or WP 007 00 (cobonded wet layup patch) are completed.

b. Cover repair with one layer of porous release fabric 3 inches past periphery of the patch. Refer to NAVAIR 01-1A-21, Section V, Vacuum Bag Repair Materials Kit 135040-1 table.

c. Cover repair area with layers of glass bleeder cloth using one ply of bleeder for two plies in laminate. Use one bleeder ply for three patch plies and two bleeder plies for five patch plies. The bleeder plies should extend past the edge of the laminate.

d. Position one layer of plastic release sheet over bleeder cloth. Cut sheet the same size as porous release fabric cloth. Puncture holes in the plastic release sheet with hypodermic syringe needle at 2 to 3 inch square spacing in the patch area. Tape edges of cloth with pressure sensitive tape.

**NOTE**

Plastic release sheet prevents adhesive from bonding to the copper sheet.

e. Cut a piece of 0.020 thick copper sheet as large as the heat blanket (7). Center copper sheet over layer of plastic release sheet.

f. Position a temperature sensor assembly (6) directly over the patch and tape in position with pressure sensitive tape.

## NOTE

One control thermocouple (6) and a minimum of 2 monitoring thermocouples (6) are required for control of 4230-103, -109, and MDA151-002 heat blankets (7).

Control thermocouple should be located in the middle of copper sheet and heat blanket. Monitoring thermocouples should be positioned 0.25 to 0.50 from the edge of the patch on the surface of the part.

g. Center heat blanket (7) over copper sheet. A minimum of 2 inches between heat blanket and the edge of the patch is required.

h. Cover heat blanket (7) with two layers of satin breather cloth.

i. Position bases of connector assemblies (8) and (10) on satin cloth at one end of heat blanket (7).

j. Apply vacuum bag tape around outside of layup. Apply extra vacuum bag tape around temperature sensor assembly (6) leads and heat blanket cable assembly (12).

k. Position WRIGHTLON 7400 plastic sheet (vacuum bag) over layup and press into vacuum bag tape to form a vacuum bag. Cover heat blanket with insulation.

l. Make small slits in plastic sheet over each vacuum connector assembly base (8) and (10) and attach quick disconnects to bases.

m. Connect repair set, 74D110165, to repair arrangement per substeps below.

(1) Connect cable assembly (1) to temperature control assembly (2) and facility power.

(2) Connect cable assembly (14) to temperature control assembly (2) and vacuum control assembly (4).

(3) Connect cable assembly (13) to temperature control assembly (2) and cable assembly (12).

(4) Connect branches of cable assembly (12) to heat blanket (7) and temperature sensor assembly (6).

(5) Connect cable assembly (11) to temperature control assembly (2) and sensor branches of cable assembly (11) to temperature sensor assembly (6).

(6) Connect hose assembly (5) to vacuum control assembly (4) and connector assembly (10).

(7) Connect gage assembly (9) to connector assembly (8).

(8) Set MASTER POWER switch on temperature control assembly (2) to ON. Do lamp test, battery test, and overtemp alarm test. After test, set MASTER POWER switch to OFF. Set MASTER POWER, CONTROLLER POWER, INDICATOR POWER, TIMER POWER, AND PRINTER POWER switches to ON position.

(9) On temperature control assembly (2), do substeps below.

(a) Set cure temperature on controller module(s) to 190°, see figure 2.

(b) Set controller module(s) for rise rate of 4°F per minute.

(c) Set cure time on timer module for 1 hour.

(d) Select channel to be displayed on indicator module(s).

(e) Select temperature sensor input to be recorded with printer source switch. Record highest bond line temperature.

## NOTE

Do not set temperature control module ON before step (11) is completed.

(10) Set POWER switch on vacuum control assembly (4) to ON. Pull vacuum of 20 to 29 inches of mercury. Smooth the wrinkles in the bag as air is evacuated while continuing to work the bagging film into the vacuum bag sealant. Inspect for audible leaks and repair them as required. The vacuum bag gage must read at least 20 inches of mercury. If a minimum of 20 inches of mercury cannot be obtained and/or audible leaks cannot be eliminated, apply new bagging materials to the repair.

(11) Precure EA956 A/B, EA9396 A/B or EA9321 A/B adhesive for 2 hours at room temperature maintaining vacuum pressure of 20 to 29 inches of mercury during cure.

(12) On temperature control assembly (2), set MASTER POWER switch to ON.

(13) Monitor all thermocouples during ramp-up to cure temperature to satisfy temperature tolerances required per figure 1. Record all thermocouple readings manually at each fifteen minutes during the cure process. Note control temperature and minimum/maximum monitoring thermocouples temperature for quality assurance.

(14) If the lowest monitoring thermocouple does not get to 180°F the following steps should be done.

(a) Increase control thermocouple set point to upper cure cycle tolerance (200°F).

(b) Add more insulation (satin cloth) on top of the heat blanket.

(c) Terminate the repair and cool to room temperature. Repeat cure cycle using larger size heat blanket.

(d) If substeps (a) through (c) did not produce acceptable monitoring thermocouple readings (190° ±10°F) get Cognizant Field Activity (CFA) depot engineering assistance.

(15) After completion of repair, set all switches to OFF. Allow repair to cool to room temperature.

(16) Disconnect and stow cable assemblies (1), (11), (12), (13), and (14); hose assembly (5); connector assemblies (8) and (10); gage assembly (9); temperature sensor assembly (6); and heat blanket (7).

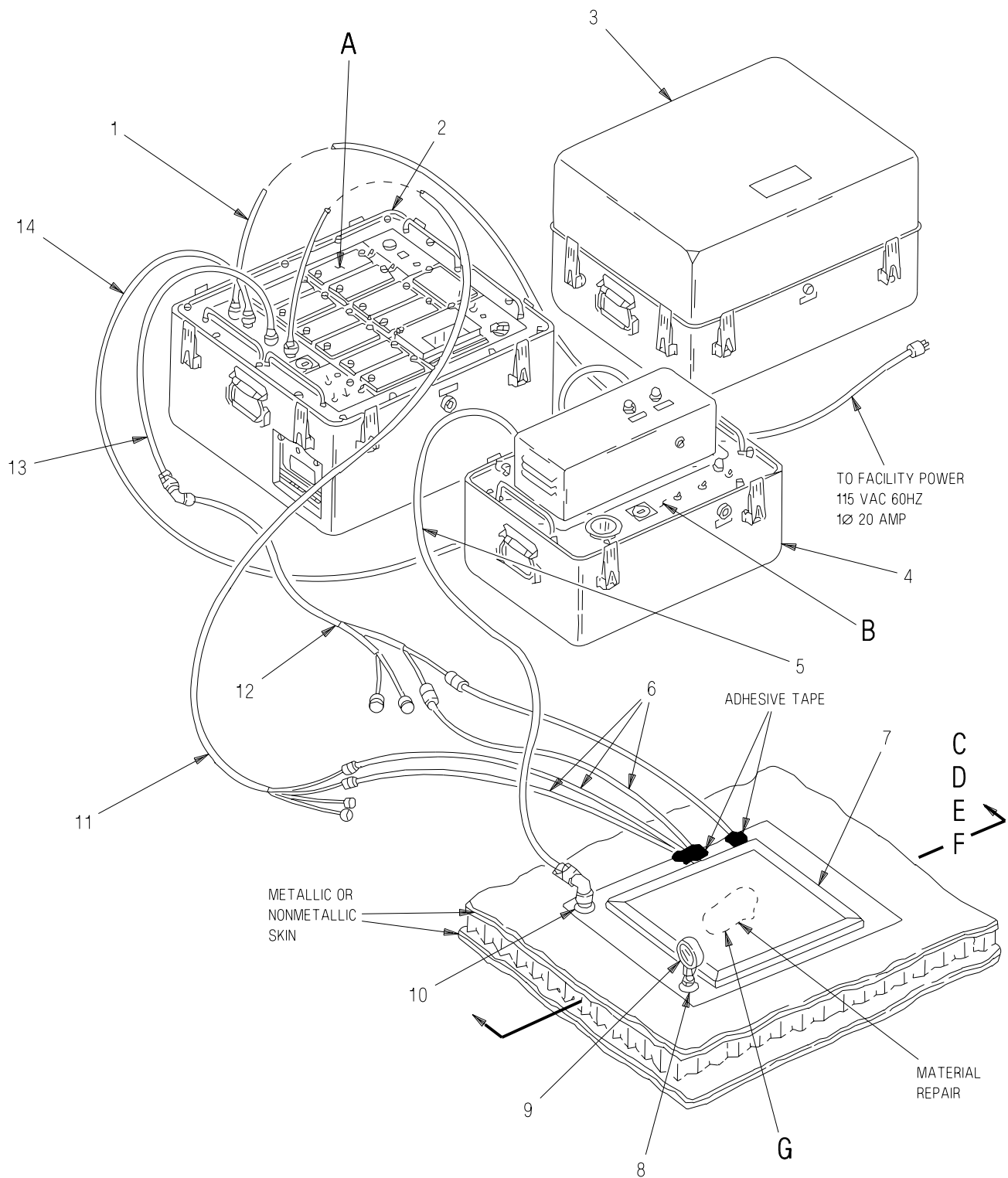
(17) Remove layers of satin cloth, copper sheet, plastic release sheet, and porous release fabric.

	MATERIAL	CURE CYCLE	HOLD TIME AT 75° F (1)	CURE TEMPERATURE (3)	SOAK TIME	MINIMUM MONITORING THERMOCOUPLE TEMPERATURE REQUIREMENTS	APPROX CYCLE TIME	REMARKS/NOTES
TWO PART LIQUID AND PASTE ADHESIVE	EA956 EA9321 EA9396	1	---	75°F MINIMUM	5 DAYS	---	5 DAYS	(2)
	EA956 EA9321 EA9396	2	2 HOURS	190° ± 10°F	1 HOUR	180°F	4 HOURS 30 MINUTES	(1), (2), (3), (4)
FILM ADHESIVE	FM300	3	---	305° ± 15°F	4 HOURS	290°F	6 HOURS 45 MINUTES	(1), (5)
	FM300-2	4	---	245° ± 15°F	2 HOURS	230°F	3 HOURS 30 MINUTES	(1), (5), (6)
FOAMING ADHESIVE	FM404	5	---	305° ± 15°F	1 HOUR	290°F	2 HOURS 45 MINUTES	(1), (7), (8)
	FM410-1	6	---	245° ± 15°F	1 HOUR	230°F	2 HOURS 30 MINUTES	(1), (7), (8), (9)
	FM410-1	7	---	245° ± 15°F	1 HOUR	230°F	2 HOURS 30 MINUTES	(1), (8), (9), (10)
WET LAY-UP PATCHES CURE	W133/EA956 W133/EA9396	8	---	190° ± 10°F	1 HOUR	180°F	2 HOURS 30 MINUTES	(1), (4), (5)
COBONDED WET LAY-UP PATCH (DIRECTLY ON THE PART SURFACE)	W133/EA956 W133/EA9396	9	2 HOURS	190° ± 10°F	1 HOUR	180°F	2 HOURS 30 MINUTES	(1), (5)

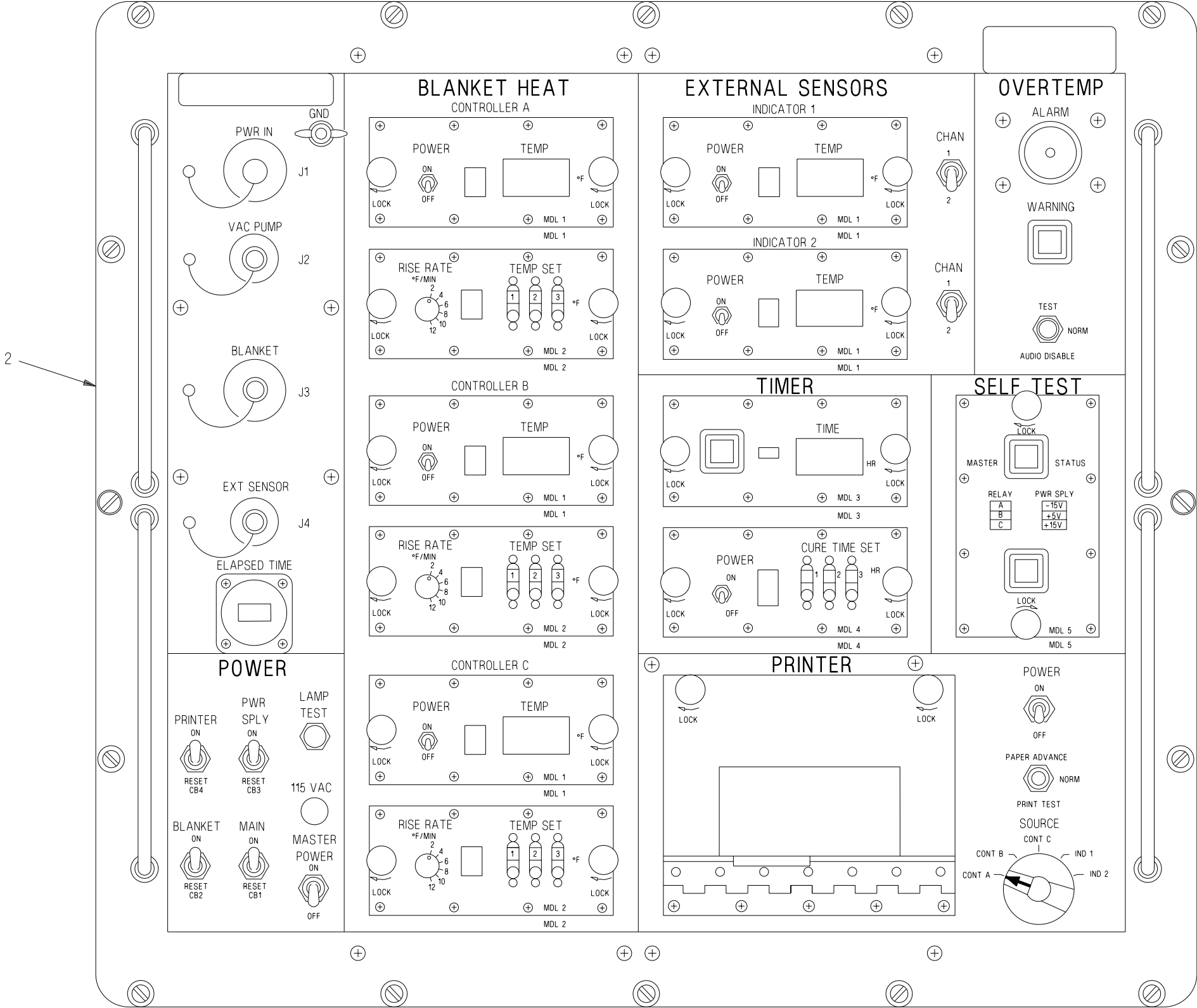
## NOTES:

- (1) ALL CURES USE A TEMPERATURE RISE RATE OF 2-6°F/MINUTE AND A MAXIMUM COOL DOWN RATE OF 5°F/MINUTE.
- (2) APPLY PRESSURE (20-29 INCHES OF MERCURY VACUUM OR CONTACT PRESSURE).
- (3) HOLD AT 75°F BEFORE APPLYING HEAT FOR THE TIME SPECIFIED IN THIS TABLE.
- (4) HEAT CURE MAY BE PERFORMED DURING A SUBSEQUENT PATCH BOND CURE CYCLE.
- (5) APPLY 20-29 INCHES OF MERCURY VACUUM DURING ENTIRE CURE CYCLE.
- (6) PREFERRED FILM ADHESIVE FOR BONDED REPAIRS.
- (7) APPLY POSITIVE PRESSURE ONLY.
- (8) A SUBSEQUENT FM300 OR FM300-2 PATCH BOND CURE CYCLE IS REQUIRED IF THIS CURE CYCLE IS USED.
- (9) PREFERRED FOAMING ADHESIVE FOR BONDED REPAIRS.
- (10) APPLY 5-10 INCHES OF MERCURY VACUUM DURING ENTIRE CURE CYCLE.

Figure 1. Structural Adhesive and Wet Layup Patch Cure Cycles



**Figure 2. Curing of EA956 A/B, EA9396 A/B, EA9321 A/B, FM300 and FM300-2 Adhesives Using 4230-103, -109 and MDA 151-002 Heat Blanket With Vacuum Bag (Sheet 1)**



A

TEMPERATURE CONTROL PANEL ASSEMBLY

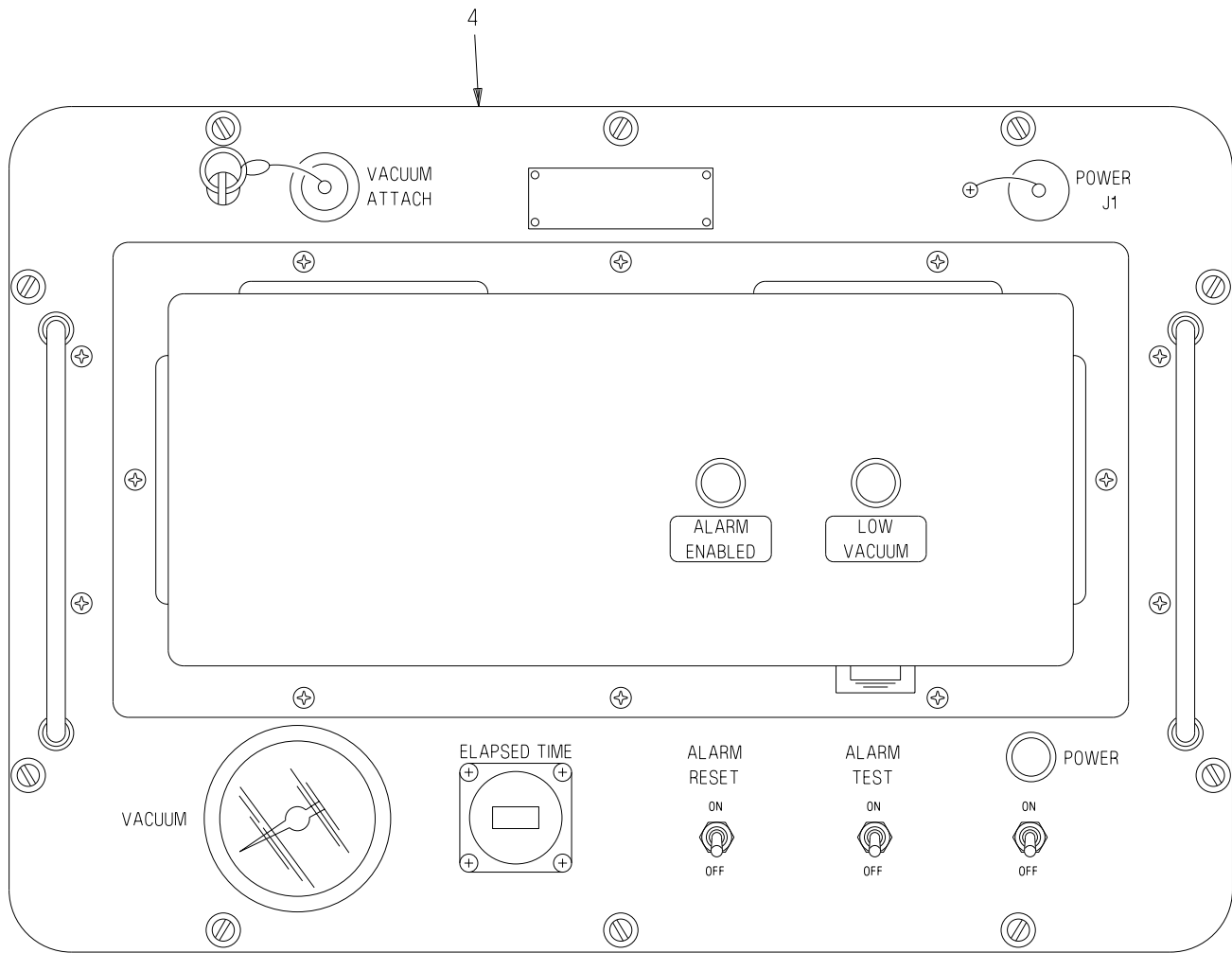
Figure 2.

Figure 2. Curing of EA956 A/B, EA9396 A/B, EA9321 A/B, FM300 and FM300-2 Adhesives Using 4230-103, -109 and MDA 151-002 Heat Blanket With Vacuum Bag (Sheet 2)

Figure 2.

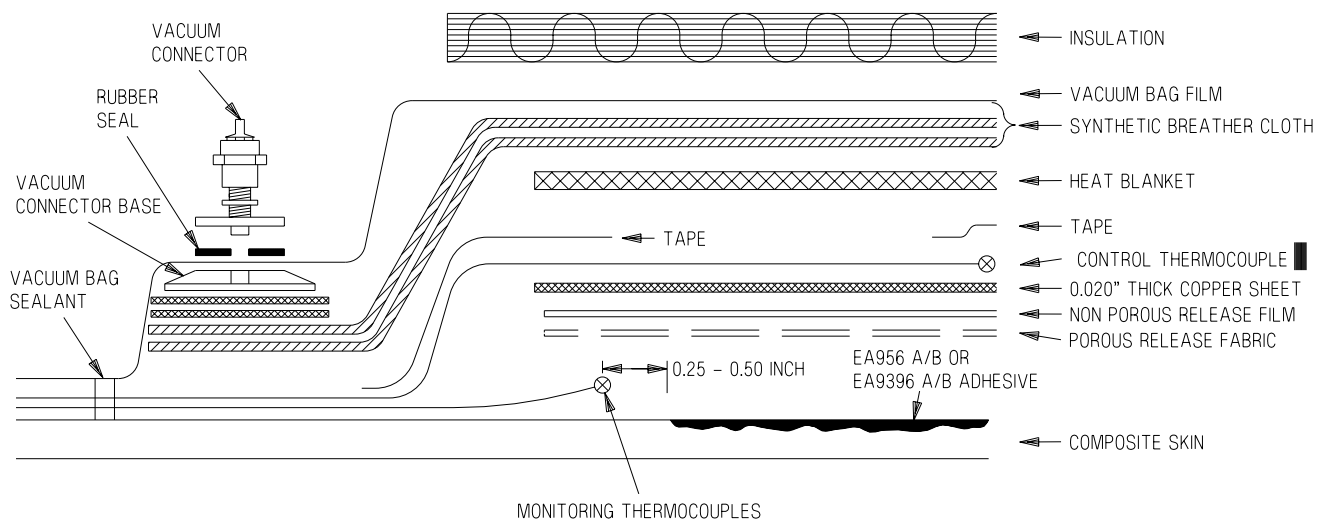






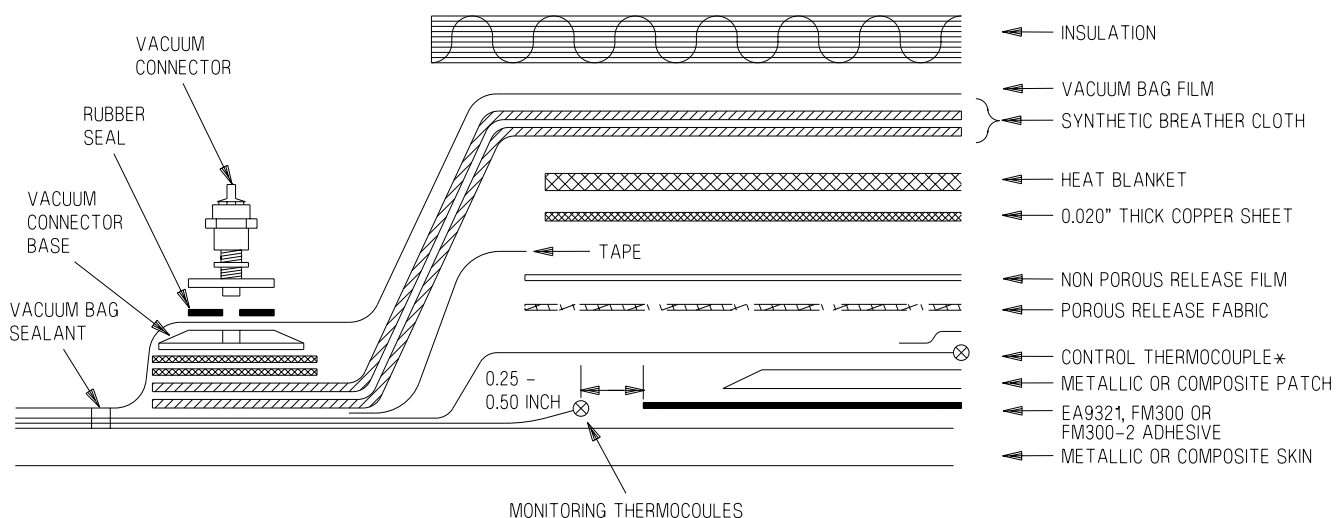
**B**  
**VACUUM CONTROL PANEL ASSEMBLY**

INDEX NO.	NOMENCLATURE	SPECIFICATION OR PART NO.
1	CABLE ASSEMBLY	74D111252-1001
2	TEMPERATURE CONTROL ASSEMBLY	74D110165-2001
3	ACCESSORY CASE	74D110165-2005
4	VACUUM CONTROL CASE	74D110165-2003
5	HOSE ASSEMBLY	74D111268-1001
6	TEMPERATURE SENSOR ASSEMBLY	74D111252-1011
7	HEAT BLANKET	4230-103, -109 OR MDA151-002
8	CONNECTOR ASSEMBLY	74D111271-1001
9	GAGE ASSEMBLY	74D111272-1001
10	CONNECTOR ASSEMBLY	74D111270-1001
11	CABLE ASSEMBLY	74D111252-1009
12	CABLE ASSEMBLY	74D111252-1007
13	CABLE ASSEMBLY	74D111252-1005
14	CABLE ASSEMBLY	74D111252-1003



C

CURING EA956 A/B OR EA9396 A/B ADHESIVES



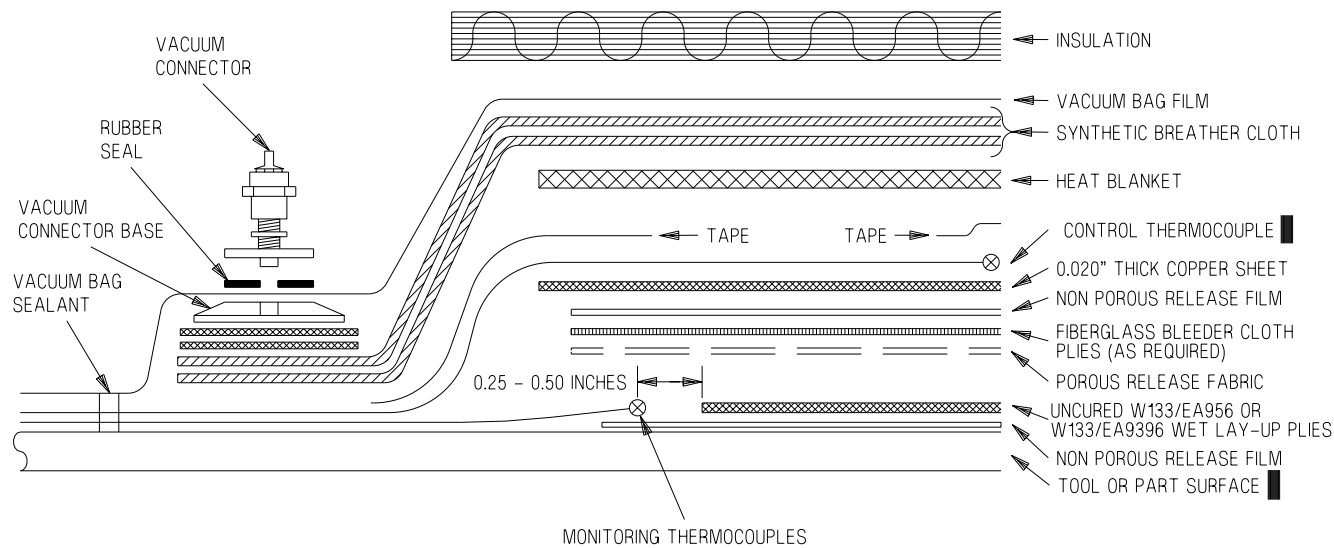
\* CONTROL THERMOCOUPLE SHOULD BE PLACED FLUSH TO PATCH WITH THE TIP TAPED TO THE PATCH. THIS ALLOWS READING THE ACTUAL PATCH TEMPERATURE RATHER THAN THE AIR TEMPERATURE.

D

CURING EA9321 A/B, FM300, OR FM300-2 ADHESIVES

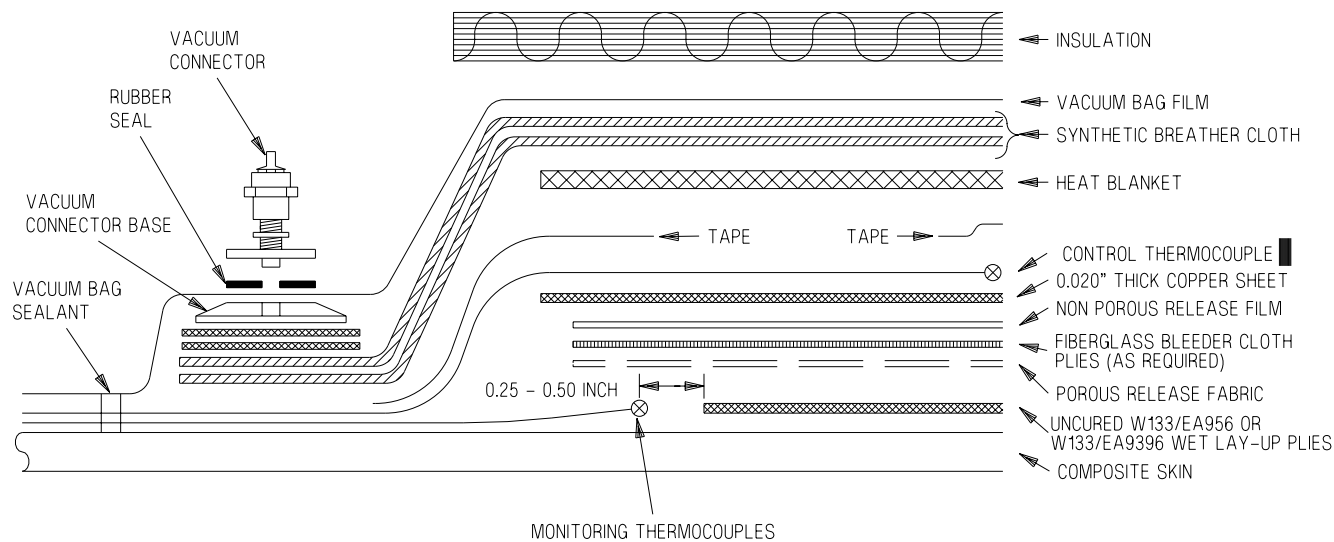
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**Figure 2. Curing of EA956 A/B, EA9396 A/B, EA9321 A/B, FM300 and FM300-2 Adhesives Using 4230-103, -109 and MDA 151-002 Heat Blanket With Vacuum Bag (Sheet 4)**



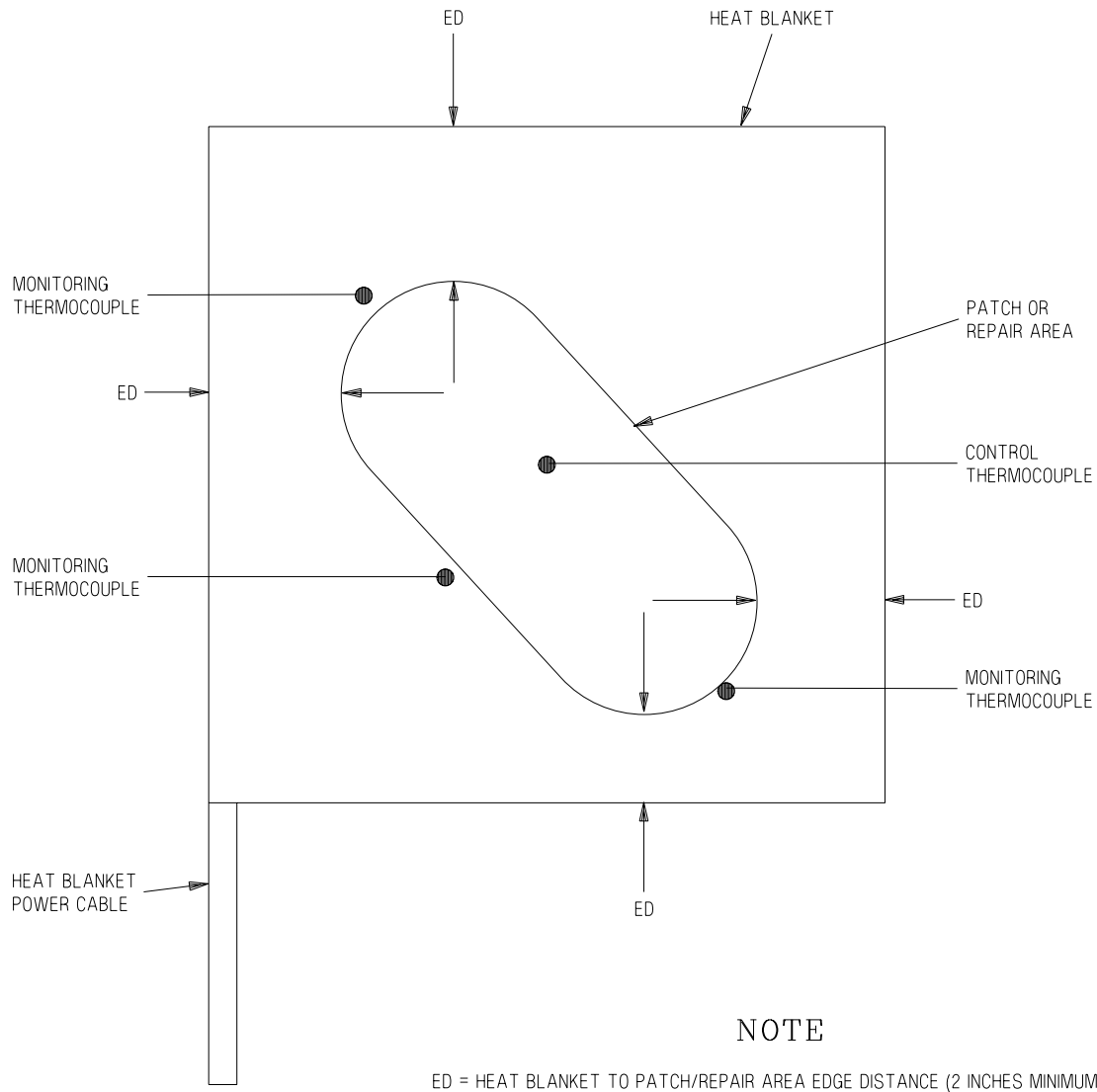
E

CURING OF W133/EA956 AND W133/EA9396 WET LAYUP PATCHES



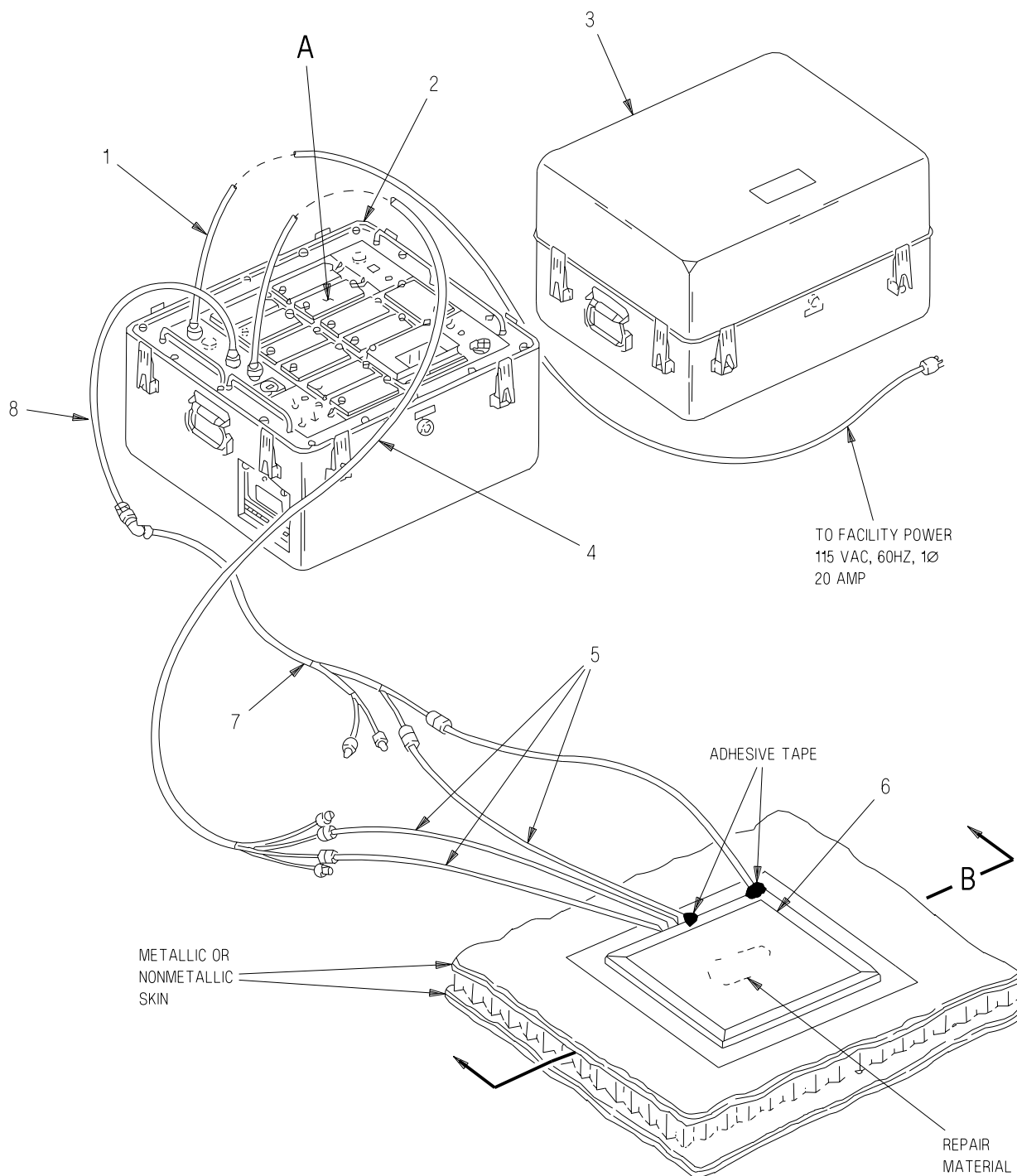
F

COBONDING OF W133/EA956 AND W133/EA9396 WET LAYUP LAMINATES DIRECTLY ON PART SURFACE



G

HEAT BLANKET SELECTION AND THERMOCOUPLE PLACEMENT



**Figure 3. Curing of FM404 and FM410-1 Foaming Adhesives Using 4230-103, -109 and MDA151-002 Heat Blanket (Sheet 1)**

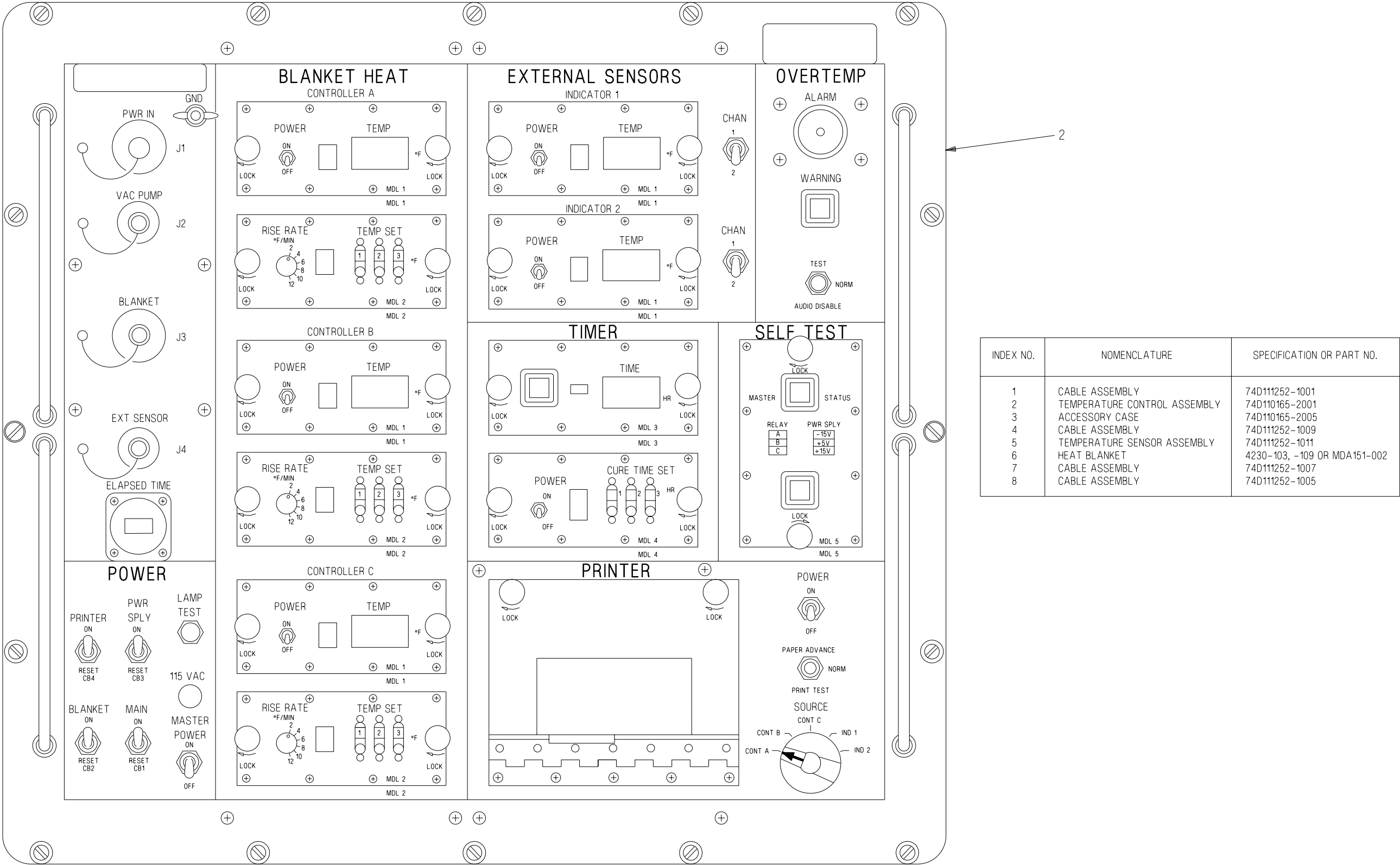


Figure 3.

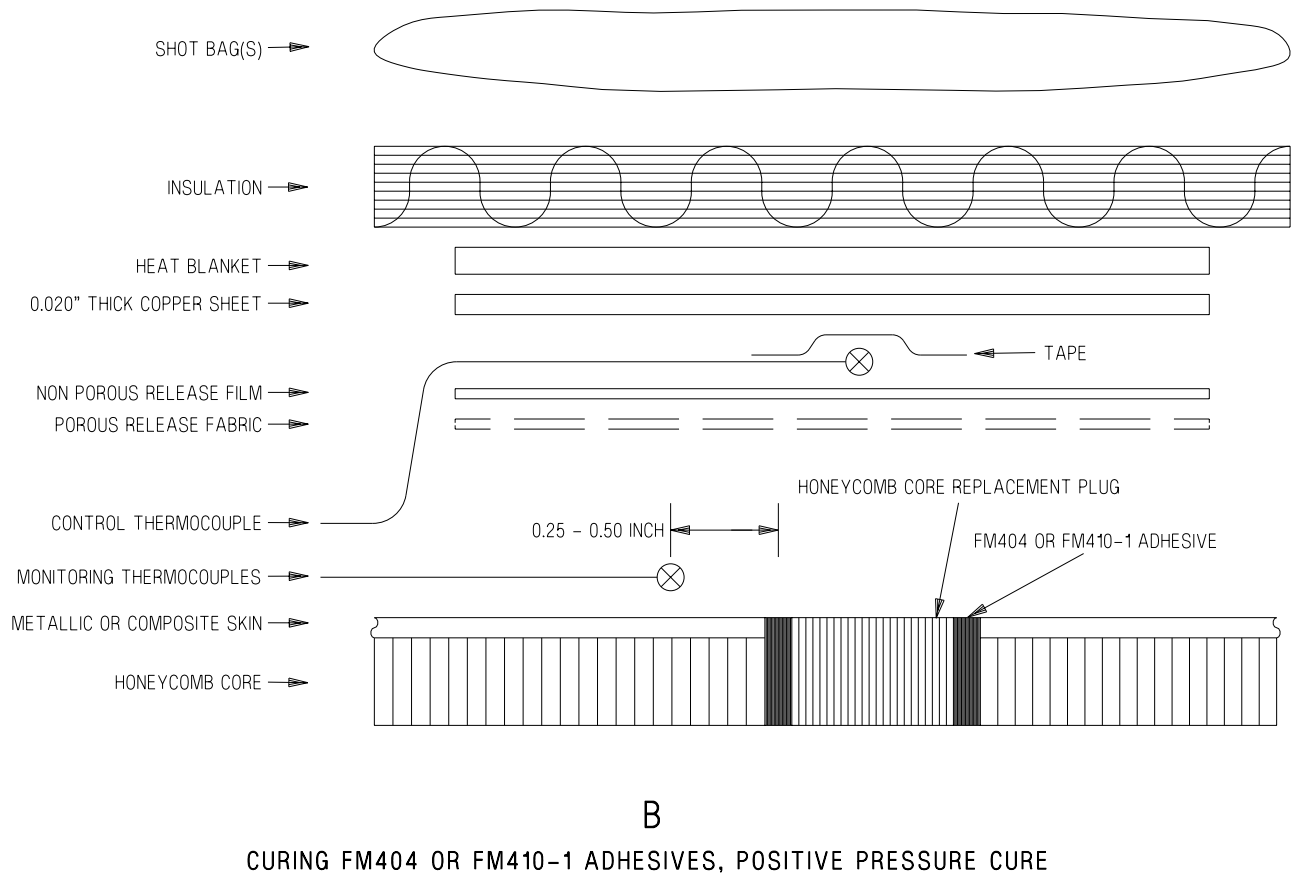
A  
TEMPERATURE CONTROL PANEL ASSEMBLY

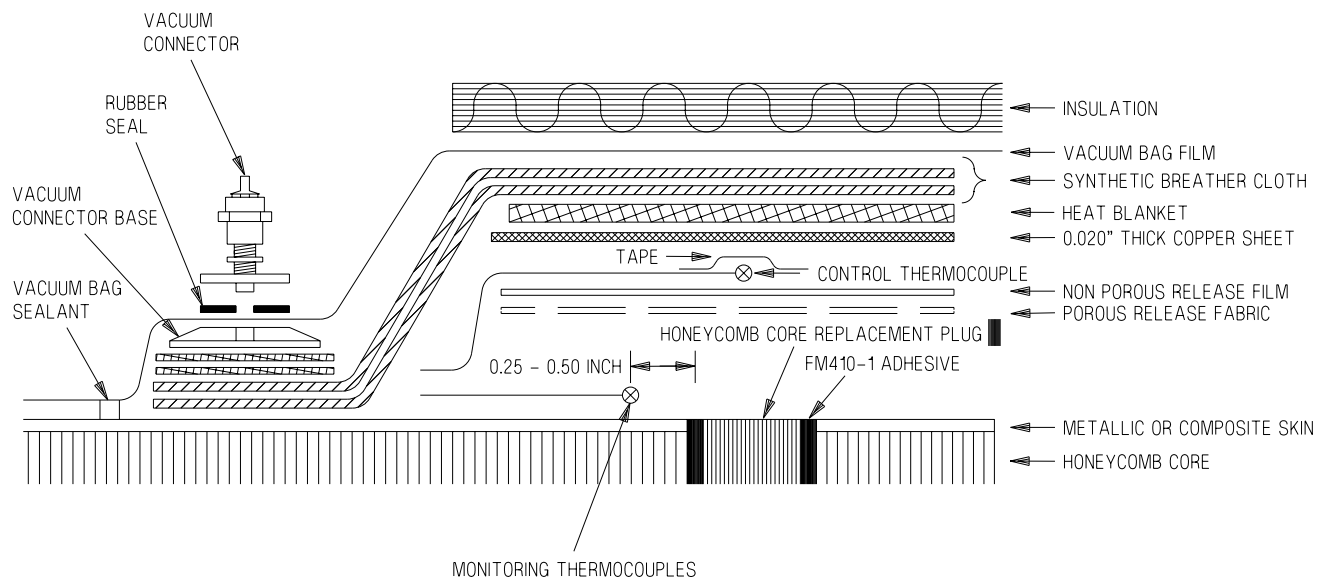
Figure 3. Curing of FM404 and FM410-1 Foaming Adhesives Using 4230-103, -109 and MDA151-002 Heat Blanket (Sheet 2)

Figure 3.

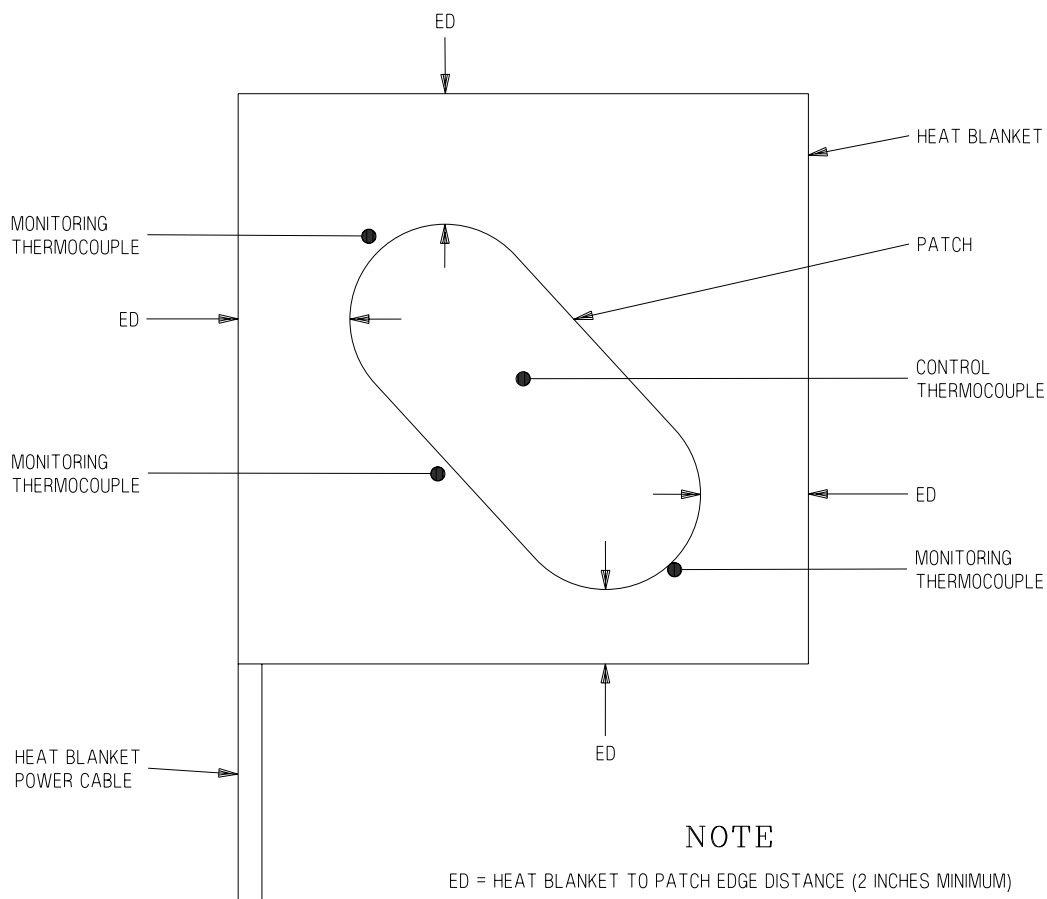








CURING FM410-1 ADHESIVE, PARTIAL VACUUM CURE



NOTE

ED = HEAT BLANKET TO PATCH EDGE DISTANCE (2 INCHES MINIMUM)

HEAT BLANKET SELECTION AND THERMOCOUPLE PLACEMENT

**Figure 4. Curing of FM410-1 Foaming Adhesives Using 1935AS100-1 Composite Repair Kit and Vacuum Bag, Partial Vacuum Cure**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## DRYING AND WATER REMOVAL PROCEDURES

This WP supersedes WP005 00, dated 1 June 2000.

## Reference Material

Non-destructive Inspection .....	A1-F18AC-SRM-300
Work Package Index.....	WP 001 00
Non-destructive Index.....	WP 001 01
Structure Repair/Typical Repairs .....	A1-F18AC-SRM-250
Storage, Preparation and Handling Procedures for Structural Adhesives.....	WP 003 00
Heating Equipment, Setup and Cure of Structural Adhesives.....	WP 004 00
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Classes V, VI, or VII Damage Repair .....	WP 018 00
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Classes III, IV, V and VII Damage Repair .....	WP 021 01
General Composite Repair.....	NAVAIR 01-1A-21
Temperature - Vacuum Control Repair Set .....	NAVAIR 17-1-131
Operating Instructions .....	WP 005 00
Temperature-Vacuum Control Repair Set A/E47M-2 Part No 1835AS100-1.	WP 007 00

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Water Removal from Intact Composite Skinned Sandwich Structures.....	6
Water Removal from Intact Aluminum Skinned Sandwich Structures .....	6

## 1. DESCRIPTION.

2. This work package contains procedures for the drying of composite laminates, composite or metal faced sandwich panels and also for water removal (Class XIII damage for honeycomb sandwich

structure) using heat blankets with vacuum pressure. For applicable index of assemblies having a honeycomb core (A1-F18AC-SRM-300, WP 001 00).

## 3. DRYING PROCEDURE WITH VACUUM BAG.

## Material Required

## Support Equipment Required

## NOTE

Part Number or  
Type Designation

## Nomenclature

Alternate item specifications or part numbers are shown indented.

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
4230-103	Heat Blanket		
4230-109	Heat Blanket		
MDA151-002	Heat Blanket		
74D110165-1001	Repair Set,	100SG30TR	Plastic Sheet (Non-
Applicable	Temperature/		porous Release Film)
Repair Set:	Vacuum Control,	CCCC440TY1CL1	Cloth, Cheesecloth
Equipment	Composite Structure	RYMPLE CLOTH -	Cloth, Cleaning
74D110165-2001	Temperature Control	301 PURIFIED	
	Assembly	D 1153	Methyl Isobutyl Ketone
74D110165-2003	Vacuum Control		Analyzed Regent
	Assembly	9151-0-500	Tape, Adhesive,
74D110165-2005	Accessory Case		Rubber
74D111270-1001	Connector Assembly	135040-1	Vacuum Bag Materials
74D111271-1001	Connector Assembly		Kit
74D111272-1001	Gage Assembly	855 1 IN	Tape, Pressure
74D111268-1001	Hose Assembly		Sensitive
74D111252-1001	Cable Assembly		
74D111252-1003	Cable Assembly		
74D111252-1005	Cable Assembly		
74D111252-1007	Cable Assembly		
74D111252-1009	Cable Assembly		
74D111252-1011	Temperature Sensor		
	Assembly		

## WARNING

All personnel carrying out water removal and drying procedures must be trained in the use of the hot bond repair system. Use of untrained personnel may result in injury to personnel or damage to equipment and/or structure.

Methyl Isobutyl Ketone is toxic to skin, eyes, and respiratory tract. Skin and eye protection is required. Avoid repeated or prolonged contact. Good ventilation is required.

## CAUTION

If water is suspected in sandwich assembly or if NDT has determined that fluid exist, do fluid removal operations in this WP or damage to structure will result.

## NOTE

Vacuum bag repair materials kit (135040-1) contains all materials listed above for doing vacuum bag repairs.

Alternate USN Temperature/vacuum control unit (1935AS100-1) can be used for this repair. Operate the unit per NAVAIR 17-1-131, WP 005 00 Manual with the following exceptions: (1) Select heat blanket per (WP004 00) and (2) adjust controller to get all thermocouples within required temperature range per figure 1 (WP004 00) during ramp-up and cure.

a. Clean repair area or component (as applicable) with clean rymple cloth or cheesecloth wet with methyl isobutyl ketone until all contaminants are removed.

## NOTE

If repair area of component has been prepared for bonded type repair, surface preparation must be redone after carrying out drying procedure.

Be sure replacement core plug (if required) has been inserted (but not bonded) in the repair cavity to support the heat blanket and vacuum bag during drying.

b. Prepare vacuum bag per WP 004 00 procedure but use the configuration shown on figure 1 or 2 of this work package.

## NOTE

Determine whether partial or a full component (envelope) vacuum bag is required. Full vacuum bag may be required if vacuum leaks are traced outside of partial vacuum bag or if difficulty occurs drying the component. If envelope bag method is selected, Make sure that supports are used to prevent collapse of honeycomb component, bending of component and bag failures.

## WARNING

c. Set up heat blanket controller per WP 004 00 procedure to a rise rate of 4° per minute and a cure temperature of 210 ±10° F.

## CAUTION

Damage to the surrounding structure will result if the cure is not monitored and the temperature rises above 220° F. If the temperature indication on the TEMPERATURE RECORDER 1 display begins to rise above 215 ±10° F, adjust the HEAT BLANKET CONTROLLER 1 until the TEMPERATURE RECORDER 1 indicates 210 °10±F again.

d. Set CURE TIMER for 2 hours.

e. After cure, disassemble vacuum bag set up per WP 004 00 procedure.

f. Do NDI to determine if damage occurred to the structure during the drying cycle (A1-F18AC-SRM-300, WP 001 01). Look for blown honeycomb core and core disbonds in sandwich assemblies.

g. Cover discrepant area with plastic sheet and seal with pressure sensitive tape. Store component in a clean, dry place until ready for next repair procedure.

**NOTE**

For dried components stored in a clean room environment, bonding cycle must be done within 7 days of drying. For components not stored in a clean room environment, bonding cycle must take place within 4 hours of drying.

#### 4. HONEYCOMB STRUCTURES PARTLY FILLED WITH WATER AROUND REPAIR CUTOUT.

#### Support Equipment Required

Part Number or Type Designation	Nomenclature
4230-103	Heat Blanket
4230-109	Heat Blanket
MDA151-002	Heat Blanket
74D110165-1001	Repair Set,
Applicable Repair	Temperature/Vacuum
Set: Equipment	Control Composite
	Structure
74D110165-2001	Temperature Control
	Assembly
74D110165-2003	Vacuum Control
	Assembly
74D110165-2005	Accessory Case
74D111270-1001	Connector Assembly
74D111271-1001	Connector Assembly
74D111272-1001	Gage Assembly
74D111268-1001	Hose Assembly
74D111252-1001	Cable Assembly
74D111252-1003	Cable Assembly
74D111252-1005	Cable Assembly
74D111252-1007	Cable Assembly
74D111252-1009	Cable Assembly

#### Support Equipment Required (Continued)

Part Number or Type Designation	Nomenclature
74D111252-1011	Temperature Sensor
	Assembly
S115/20GAGE1-1/2IN	Needle, Hypodermic
—	Moisture Detector
	Assembly

#### Material Required

**NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
100SG30TR	Plastic Sheet (Nonporous Release Film)
9151-0-500	Tape, Adhesive, Rubber
135040-1	Vacuum Bag Materials Kit
855 1 IN	Tape, Pressure Sensitive
CCCC440TY1CL1 RYMPLE CLOTH- 301-PURIFIED	Cloth, Cheesecloth Cloth, Cleaning



## WARNING

All personnel carrying out water removal and drying procedures must be trained in the use of the hot bond repair system. Use of untrained personnel may result in injury to personnel or damage to equipment and/or structure.

## NOTE

Vacuum bag repair materials kit (135040-1) contains all materials listed above for doing vacuum bag repairs.

Alternate USN Temperature/vacuum control unit (P/N 1935AS100-1) can be used for this repair. Operate the unit per NAVAIR 17-1-131, WP 007 00 Manual with the following exceptions:

a) Select heat blanket per WP 004 00.

b) Adjust controller to get all thermocouples within required temperature range per WP 004 00, figure 1 during ramp-up and cure.

a. Do NDI of surrounding structure to determine the amount of the affected area (A1-F18AC-SRM-300, WP 001 01).

## NOTE

If size of contaminated area exceeds repairable limits stated in the part specific work package, seek engineering disposition.

b. Remove skin within the amount of affected area.

c. Inspect for corroded core or core damage and remove as required. If opposite skin is intact, remove per WP 018 00 or WP 021 00.

d. Wipe repair area using a clean dry rymple cloth.

## NOTE

Be sure replacement core plug (if required) has been inserted (but not bonded) in the repair cavity to support the heat blanket and vacuum bag during drying.

e. Manually perforate release film with 2 to 3 holes per square inch using 20 gage hypodermic needle. Prepare vacuum bag per WP 004 00 procedure but use the configuration shown on figure 1 or 2 of this work package.

## NOTE

Determine whether partial or full component (envelope) vacuum bag is required. Full vacuum bag may be required if vacuum leaks are traced outside of partial vacuum bag or if difficulty occurs drying the component. If envelope bag method is selected, make sure that supports are used to prevent collapse of honeycomb component, bending of component and bag failures.

f. Set up heat blanket controller per WP 004 00 procedure to a rise rate of 4° per minute and a cure temperature of 210 ±10° F.

## CAUTION

Damage to the surrounding structure will result if the cure is not monitored and the temperature rises above 220° F while water exists. If the temperature indication on the TEMPERATURE RECORDER 1 display begins to rise above 215 ±10° F, adjust the HEAT BLANKET CONTROLLER 1 until the TEMPERATURE RECORDER 1 indicates 210 ±10° F again.

g. Set CURE TIMER for 6 hours.

(1) Fill moisture detector assembly with desiccant, refer to NAVAIR 01-1A-21, Equipment and Tools to do Specialized Operation, Moisture Indicator. Cap inlet and outlet with filters made from rymple cloth.

(2) After 5 hours of drying cycle, inspect for presence of water vapor by connecting moisture detector assembly in series with bag vacuum line and connect to vacuum sniffer. If there is a color change (pink color) in the desiccant after one hour, continue drying for an 6 more hours. Replace desiccant with new dry desiccant during the last hour of the drying cycle. Repeat cycle after 6 hours until there is no color change.

h. After cure, disassemble vacuum bag set up per WP 004 00 procedure.

i. Inspect release ply material for presence of contaminants. If contamination exists, engineering disposition is required.

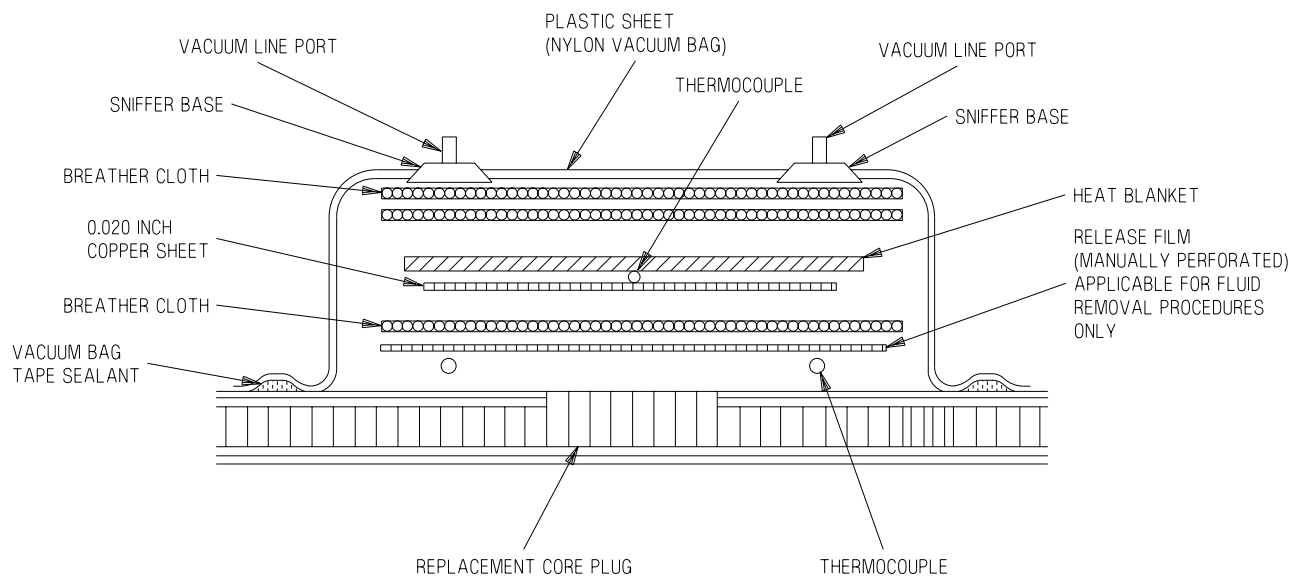
j. Do NDI (A1-F18AC-SRM-300, WP 001 01) to determine if damage occurred to the structure

during the drying cycle. Look for blown honeycomb core and core disbonds in sandwich assemblies.

k. Cover discrepant area with plastic sheet and seal with pressure sensitive tape. Store component in a clean, dry place until ready for next repair procedure.

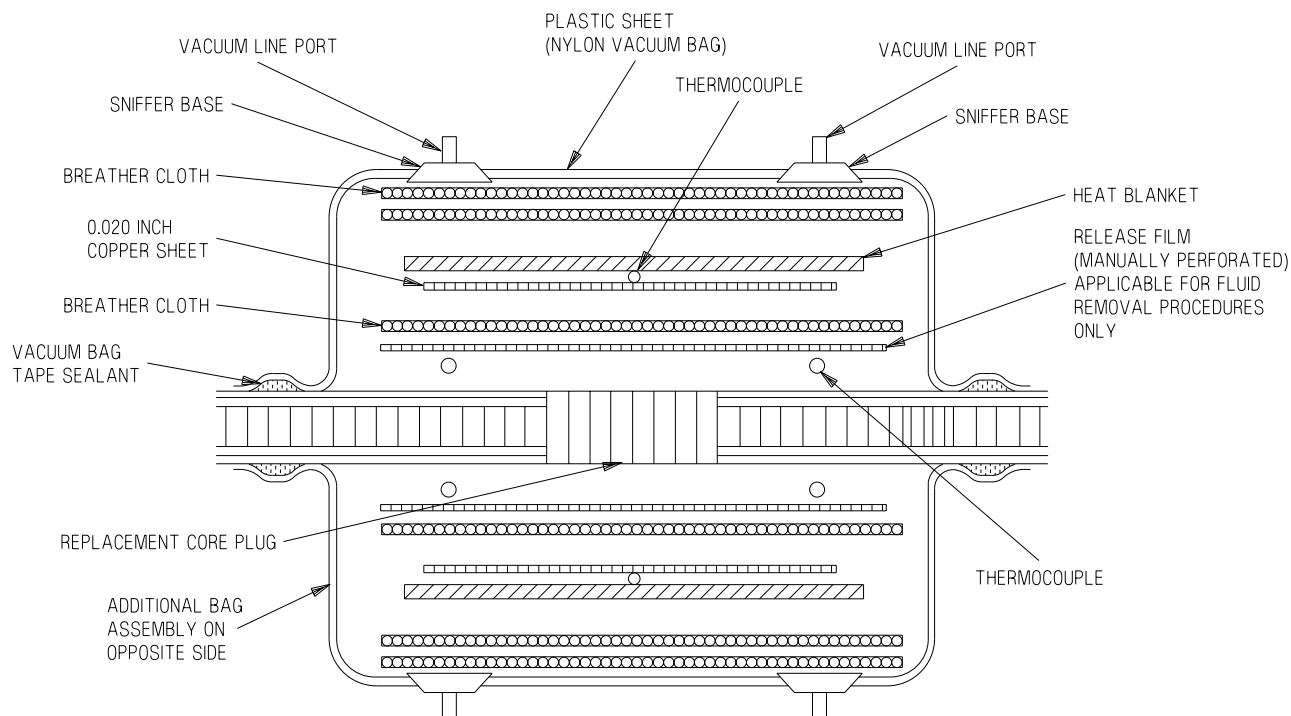
**5. WATER REMOVAL FROM INTACT COMPOSITE SKINNED SANDWICH STRUCTURES.** Water removal requires a depot engineering disposition.

**6. WATER REMOVAL FROM INTACT ALUMINUM SKINNED SANDWICH STRUCTURES.** Water removal requires a depot engineering disposition.



ADA790-5-1-039

**Figure 1. Drying and Water Removal Setup for Partial Vacuum Bagging of Honeycomb Structures With One Sided Cutout**



ADA790-91-1-039

**Figure 2. Drying and Water Removal Setup for Partial Vacuum Bagging of Honeycomb Structure with Two Sided Cutout**



## DEPOT MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## CARBON EPOXY AND TITANIUM FOIL PATCH FABRICATION

This WP supersedes WP006 00, dated 1 May 2001.

## Reference Material

Structure Repair/Typical Repairs .....	A1-F18AC-SRM-250
Storage, Preparation And Handling Procedures For Structural Adhesives.....	WP 003 00
Heating Equipment Setup And Cure Of Structural Adhesives.....	WP 004 00
Aluminum, Carbon Epoxy and Titanium Patch Installation and Removal .....	WP 007 00
General Composite Repair.....	NAVAIR 01-1A-21

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Fabrication of Patches From 30 Inch X 30 Inch Carbon Epoxy Patch Laminate.....	2
Precured Circular Carbon Epoxy Patch Description.....	1
Titanium Foil Patch Description.....	5

## Record of Applicable Technical Directives

None

## 1. DESCRIPTION.

## NOTE

Procedures do not include surface preparation for bonding. Surface preparation of carbon epoxy and titanium patches must be done (WP 007 00).

2. This work package contains procedures for fabrication of carbon epoxy and titanium foil

patches. The fabrication procedures use 74K000002 carbon epoxy or 74K000003 titanium patch kits, and include the procedures for manufacturing precured wet layup patches.

## 3. PRECURED CIRCULAR CARBON EPOXY PATCH DESCRIPTION.

4. Circular carbon epoxy patches are included in 74K000002 repair kit. For circular patch sizes, see figure 1.

**NOTE**

Leave peel ply on the patch until just before the surface preparation step to prevent contamination.

**5. FABRICATION OF PATCHES FROM 30 INCH X 30 INCH CARBON EPOXY LAMINATE.**

6. Precured carbon epoxy 30 inch X 30 inch patch material is included in 74K000002 repair kit. For patch description, see figure 2.

**Support Equipment Required**

Part Number or Type Designation	Nomenclature
—	Marking Pen, Permanent ink
10L1281-36 DOTCO	90 Degree Router Motor
45-2787A DOTCO MW101MD80	Overhose Assembly Wheel, Abrasive
—	Sanding Disk Holder
4SE01754	Hepa Filter Vacuum Cleaner
HSPG	Sealer Iron, Elect

**Materials Required**

**NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
—	Sanding Disk, 180 grit
74K000002-1023	Precured 30.00 X 30.00 Carbon Epoxy Patch Material
ANSI B74.18 GRIT 150 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 180 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 240 SILICON CBD	Paper, Abrasive
CCCC440TYICL1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning

**Materials Required (Continued)**

**NOTE**

Alternate item specifications or part numbers are shown indented.

MIL-B-121 TYPE 2	Barrier Material
GRADE A CLASS 1	(Kraft Paper)
MILB131CLASS1	Barrier Material, Water Vapor Proof

**NOTE**

Leave peel ply on patch surface until after patch is cut.

a. Layout patch dimensions (provided by the SRM or separate damage engineering disposition) on the peel ply on the patch using a marking pen.

**WARNING**

Sanding and cutting of carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount of dust may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Section X, Health and Safety.

**CAUTION**

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract particulate away from aircraft and electrical equipment.

b. Using a 90 degree router motor, an overhose assembly, and a diamond cutting wheel, cut patch to the required dimensions from the patch material. Use a filter vacuum cleaner to control dust generated by cutting procedure.

c. Cautiously remove the peel ply from both surfaces of the patch to prevent pulling fibers out of the laminate. If fiber removal starts during peel ply

removal, change the peel ply removal direction 90 degrees to the patch outer ply fibers.

d. Taper the edge of the patch to the dimensions shown in figure 3. Use a 90 degree router motor, overhose assembly, a sanding disk holder, and a sanding disk. For sanding disk and sanding disk holder, refer to NAVAIR 01-1A-21, Repair Equipment/Tools, Sanding Disk and Sanding Disk Holder.

e. Wipe the sanded surface with clean dry rymple cloth to remove sanding residue.

f. Following sanding residue removal, handle the patch wearing clean white cotton gloves.

g. Cover the patch with clean kraft paper, make sure the wax free side of the paper is in contact with the prepared surface. Form a bag with the barrier paper and tape edges closed.

h. If the patch is not to be bonded within 24 hours store in a heat sealed MILB131 vapor proof bag.

i. For preparation of carbon epoxy surface for bonding (WP 007 00).

j. Return unused part of 30 X 30 inch laminate to MILB131 water vapor proof bag, reheat seal and store.

#### 7. CARBON EPOXY WET LAYUP PATCH FABRICATION.

8. This procedure is for manufacturing precured composite patch using wet layup material.

#### Support Equipment Required

Part Number or Type Designation	Nomenclature
—	Marking Pen, Permanent Ink

#### Support Equipment Required (Continued)

Part Number or Type Designation	Nomenclature
10L1281-36 DOTCO	90 Degree Router Motor
45-2787A DOTCO MW101MD80 4SE01754	Overhose Assembly Wheel, Abrasive Hepa Filter Vacuum Cleaner
GGG-S-00278	Shears, Straight Trimmers
P.A.-1, 3M Co, Cage No. 76381	Adhesive Spreader

#### Materials Required

##### NOTE

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
W-133 9151-0-500 EA956 A/B EA9396 A/B CCCC440TYICL1 RYMPLE CLOTH- 301-PURIFIED 855 1 IN	Cloth, Graphite Woven Tape, Adhesive Rubber Resin/Adhesive Resin/Adhesive Cloth, Cheesecloth Cloth, Cleaning
100SG30TR	Tape, Pressure Sensitive Plastic Sheet (Non- Porous Release Film)
TEMP-R-GLAS6TB ANSI B74.18 GRIT 150 SILICON CBD	Cloth, Coated Paper, Abrasive
ANSI B74.18 GRIT 180 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 240 SILICON CBD	Paper, Abrasive



## NOTE

Wet layup patch can be fabricated on a slave part, a damaged part with a restored mold line or on a tool. The slave part or tool mold line curvature should represent the repair area of mold line surface curvature.

### a. Tool surface preparation.

(1) Lightly hand sand area where patch is to be applied to remove any surface protrusions. Remove sanding residue using clean rymple cloth.

(2) Tape one layer of release film over slave part where patch is to be fabricated/installed.

### b. Dry carbon cloth impregnation.

(1) Cut large piece of dry woven carbon fiber cloth to make the required number of plies with required ply orientation for wet layup assembly as specified in applicable SRM work package or engineering disposition.

## NOTE

Approximately 48 grams of resin is required per square foot of cloth. To avoid potential exotherm or gelling of resin, mix only amount of material to be used within 40 minutes (20 minutes for ambient temperature in excess of 90 degrees F).

(2) Tape one layer of Teflon release fabric over a clean flat surface. Teflon release fabric shall be cut larger than dry woven carbon fiber cloth.

## NOTE

Vacuum pressure must be applied to wet layup patch within 30 minutes of mixing the resin/adhesive.

(3) Prepare resin (WP 003 00).

(4) Apply layer of resin to Teflon release fabric one inch past periphery of patch.

(5) Position layer of dry woven carbon fiber cloth on resin.

(6) Apply resin to exposed/dry side of carbon fiber cloth.

(7) Position another layer of Teflon release fabric over saturated carbon fiber cloth.

(8) Work resin into cloth using adhesive spreader. The cloth must be evenly saturated with resin. Inspect for dry spots and spread the resin to make sure saturation of the cloth. Mark the orientation and ply number on the Teflon release fabric for each patch ply per part specific work package.

### c. Cut impregnated plies and fabricate patch

## NOTE

A 0.5" to 1.0" excess trim shall be left around periphery of each ply for final trimming to part/repair configuration.

(1) Cut the plies to required size and ply orientation.

(2) Apply a thin layer of resin/adhesive to release film on slave part.

(3) Remove layer of Teflon release fabric from one side of wetted ply.

(4) Making sure of correct ply orientation, position non-Teflon covered side of wetted ply over the thin layer of resin/adhesive on the release film on the slave surface.

(5) Remove second layer of Teflon release fabric from surface of installed ply.

(6) Repeat process for all required saturated plies.

## NOTE

Fabricated patch must be subjected to a two hour room temperature dwell under vacuum before elevated temperature cure.

### d. Cure wet layup patch (WP 004 00).

e. Remove patch, tape and non perforated cloth from slave part.

### f. Trim Patch.

(1) Layout patch dimensions (provided by the SRM or separate damage engineering disposition) on the outer surface of the patch using a marking pen.

## WARNING

Sanding and cutting of carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount of dust may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Health and Safety.

## CAUTION

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract particulate away from aircraft and electrical equipment.

(2) Using a 90 degree router motor, an overhose assembly, and a diamond cutting wheel, cut patch to the required dimensions from the patch material. Use a filter vacuum cleaner to control dust generated by cutting procedure.

(3) Cover the patch with clean kraft paper, make sure the wax free side of the paper is in contact with the prepared surface. Form a bag with the barrier paper and tape edges closed.

(4) If the patch is not to be bonded within 24 hours store in a heat sealed MILB131 water vapor proof bag.

g. For preparation of patch surface for bonding (WP 007 00).

### 9. TITANIUM FOIL PATCH DESCRIPTION.

10. Prefabricated 0.012 and 0.016 thick titanium patches are included in 74K000003 repair kit. For patch dimensions, see figure 4. For patch installation (WP 007 00).

SIX PLIES (0.0312 TOTAL THICKNESS) DIMENSIONS	
DASH NO.	PATCH DIA
-1005	2.75
-1007	4.00
-1009	5.25
-1011	6.50
-1013	7.75
-1015	9.00
-1017	10.25
-1019	11.50
-1021	12.75

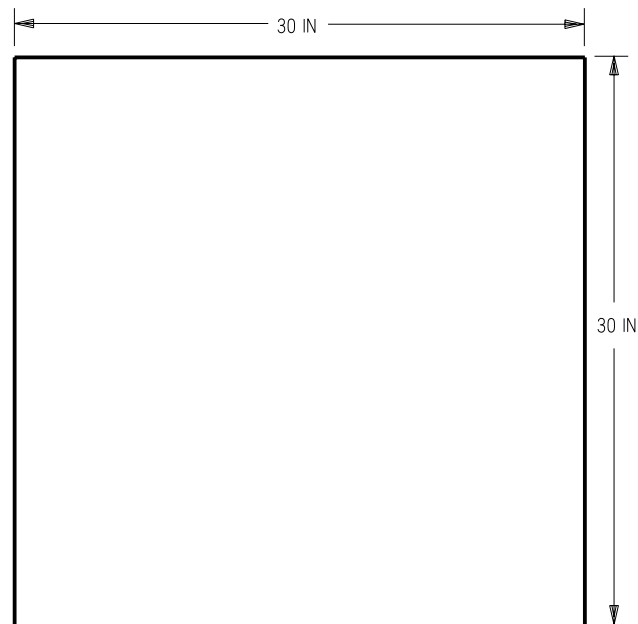
  

THREE PLIES (0.0156 TOTAL THICKNESS) DIMENSIONS	
DASH NO.	PATCH DIA
-1001	2.75
-1003	2.25

NOTE: PEEL PLY IS PRESENT ON BOTH SIDES OF THE PATCH

ADA790-6-1-039

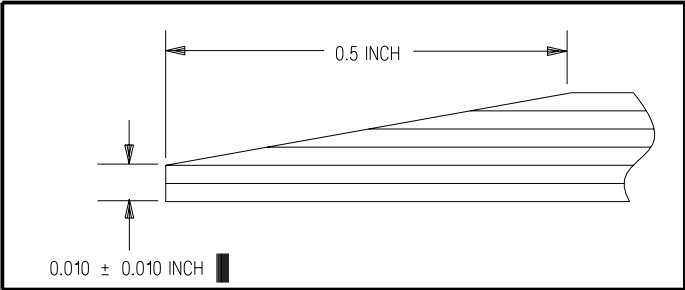
**Figure 1. Precured Circular Carbon Epoxy Patches Configuration (74K000002 C/E Patch Repair Kit)**



- NOTES:
1. SIX PLIES (0.312 TOTAL THICKNESS) DIMENSIONS  
DASH NO. -1023
  2. PEEL PLY IS PRESENT ON BOTH SIDES OF THE PATCH

ADA790-81-1-039

**Figure 2. Precured 30 inch X 30 inch Carbon Epoxy Patch Material (74K000002 C/E Patch Repair Kit)**



ADA790-82-1-041

Figure 3. Patch Edge Taper Dimensions

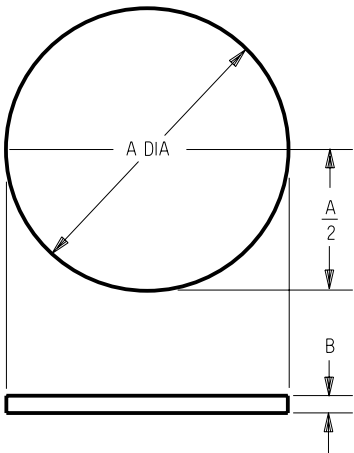


TABLE 1

DASH NUMBER	A DIAMETER	B THICKNESS
-2001	2.75	0.012
-2003	3.50	0.012
-2005	4.00	0.012
-2007	4.75	0.012
-2009	5.25	0.012
-2011	6.00	0.012
-2013	6.50	0.012
-2015	7.25	0.012
-2017	7.75	0.012
-2019	8.50	0.012
-2021	9.00	0.012
-2023	9.75	0.012
-2025	10.25	0.012
-2027	11.00	0.012
-2029	11.50	0.012
-2031	12.25	0.012
-2033	12.75	0.012
-2035	2.75	0.016
-2037	4.00	0.016
-2039	5.25	0.016
-2041	6.50	0.016
-2043	7.75	0.016
-2045	9.00	0.016
-2047	10.25	0.016
-2049	11.50	0.016

ADA790-71-1-039

Figure 4. Titanium Patch Dimensions



## ORGANIZATIONAL AND INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ALUMINUM PATCH FABRICATION

This WP supersedes WP006 01, dated 1 June 2000.

## Reference Material

Structure Repair, Typical Repairs .....	Al-F18AC-SRM-250
Aluminum, Carbon Epoxy and Titanium Patch Installation and Removal .....	WP 007 00

## Alphabetical Index

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Alclad Spot Test.....	2

## Record of Applicable Technical Directives

None

## 1. DESCRIPTION.

2. This work package details patch fabrication procedures for typical repairs to aluminum adhesively bonded structures.

## 3. ALUMINUM PATCH FABRICATION.

## Materials Required

## NOTE

Alternate item specifications or part numbers are shown indented.

## Support Equipment Required

None

Specification or Part Number	Nomenclature
QQ-A-250	Aluminum Alloy
E-007	Gloves, Surgeons
D 1153	Methyl Isobutyl Ketone Analyzed Reagent
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive

**Materials Required (Continued)****NOTE**

Alternate item specifications or part numbers are shown indented.

ANSI B74.18 GRIT 240 Cloth, Abrasive  
AL OXIDE

**WARNING**

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

**NOTE**

This procedure does not include surface preparation for bonding. Surface preparation of aluminum patches must be done per (WP007 00).

Circular patches should be used unless other is specified.

a. Wearing clean latex gloves, remove gross contamination from the surface of aluminum alloy, cut from sheet stock, using methyl isobutyl ketone and cheesecloth or rymple cloth.

b. If the alclad side of material is not recognizable or identified, use spot test method specified in paragraph 4 of this work package.

c. Fabricate patches to required size and thickness per figure 1 this work package as directed by parts specific structural manual. Chamfer edges of patch using 180 grit aluminum oxide abrasive paper. Smooth edges using 240 grit aluminum oxide abrasive paper. Wipe patch with clean dry cheesecloth or rymple cloth.

d. For preparation of patch surface for bonding (WP 007 00).

**4. ALCLAD SPOT TEST.****Support Equipment Required**

None

**Materials Required**

Specification or Part Number	Nomenclature
A-A-895	Sodium Hydroxide
DISTILLEDWATER	Distilled Water, ACS
COM-MERCIAL	
GG-D-226	Depressor, Tongue
Commercial	Overalls, Disposable
Availability	
Commercial	Respirator, Full Face
Availability	
MIL-G-12223 TYPE 2	Gloves, Toxicological

a. This procedure is to be used to identify a clad surface on aluminum alloy materials.

**WARNING**

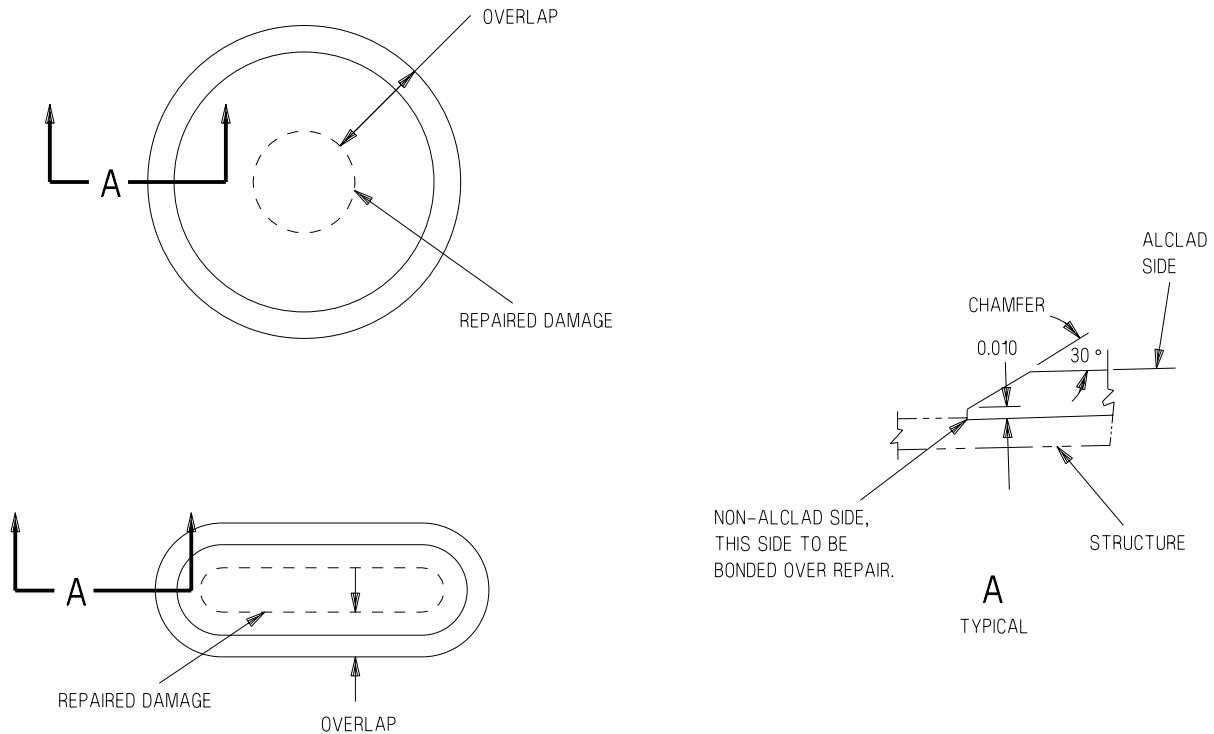
Sodium Hydroxide is hazardous to skin, eyes and respiratory tract. Skin, eye and respiratory protection are required. Good ventilation is required.

b. Using a spatula, mix thoroughly 3-1/2 to 4 ounces of sodium hydroxide with one quart of distilled water.

c. Put one drop of solution on each side of patch and allow solution to remain for 1 to 2 minutes. Rinse with distilled water and allow to dry.

d. Inspect color of each spot on the surface. The side with the lighter colored spot is alclad. The presence of a dark coloration indicates alclad is missing. For patches, the clad side shall be the outer mold line (non-bonding) side. Do all preparation and bonding on the non-clad side.





DAMAGED SKIN THICKNESS	REPAIR PATCH THICKNESS	OVERLAP
0.020 OR LESS	0.020	1-1/4 INCH
0.021 TO 0.025	0.025	1-1/4 INCH
0.026 TO 0.032	0.032	1-1/4 INCH
0.033 TO 0.040	0.040	1-1/4 INCH
0.041 TO 0.050	0.050	1-1/4 INCH
0.051 TO 0.063	0.063	1-1/2 INCH
0.064 TO 0.071	0.071	1-1/2 INCH
0.072 TO 0.080	0.080	1-1/2 INCH
0.081 TO 0.090	0.090	1-1/2 INCH

**Figure 1. Aluminum Patch Fabrication**



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## ORGANIZATIONAL AND INTERMEDIATE MAINTENANCE

### STRUCTURE REPAIR

### TYPICAL REPAIR

### ROUTER HOLDER, ADJUSTABLE

### PART NO. IED84-232

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### Reference Material

None

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### Record of Applicable Technical Directives

None

### 1. INTRODUCTION.

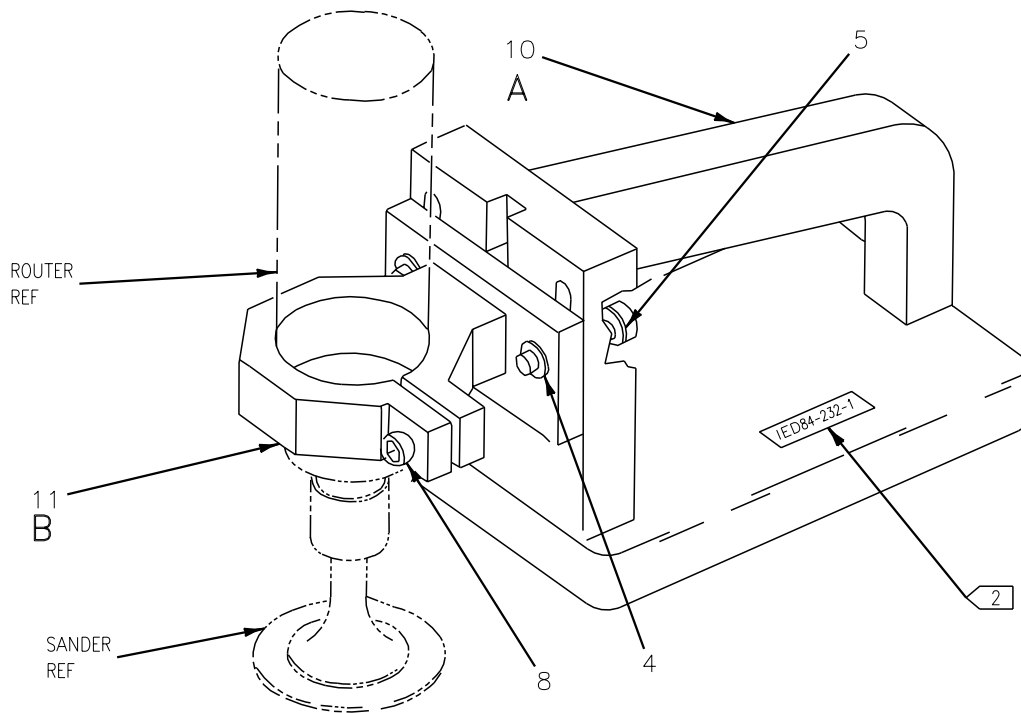
2. This work package provides for the use of an adjustable router holder when making graphite epoxy, aluminum, or titanium typical repairs. The holder may be used where procedures call for repairs to be sanded flush with mold line. Use of the holder is organizational maintenance, fabrication is intermediate maintenance. See figure 1 for bill of material, legend, and illustration of how to fabricate the router holder.

### Support Equipment Required

None

### Materials Required

None



		BILL OF MATERIAL	
INDEX NO.	NOMENCLATURE	SPECIFICATION OR PART NO.	MATERIAL
1	PLATE	-202 3/4-INCH THICK	6061-T6 ALUMINUM
2	PLATE	-201,3/4-INCH THICK	6061-T6 ALUMINUM
3	PLATE	-102,3/4-INCH THICK	6061-T6 ALUMINUM
4	SOCKET HEAD CAP SCREWS (2 REQD)	-002,1/4-20X1 1/2 THICK	STEEL
5	WASHERS (2 REQD)	-003,1/4-INCH DIAMETER	STEEL
6	PLATE	-101,3/4-INCH THICK	6061-T6 ALUMINUM
7	INSERTS (3 REQD)	-001,1/4-20X7/16-14	STEEL
4 8	SOCKET HEAD CAP SCREW	-004,1/4-20X1 INCH	STEEL
9	PLATE	-103,3/4-INCH THICK	6061-T6 ALUMINUM
10	BASE ASSEMBLY	-100 CONSISTS OF INDEX NO'S 3, 6, AND 9	
3 11	SIDE ASSEMBLY	-200 CONSISTS OF INDEX NO'S 1, 2, 7, AND 8	

### LEGEND

- 1 THE ROUTER HOLDER IS A WELDED ASSEMBLY AND IS USED FOR REMOVING EXCESS MATERIAL WHEN MAKING REPAIRS.
- 2 ETCH DRAWING NUMBER THIS AREA, (IED84-232-1).
- 3 THE -200 SLIDE ASSEMBLY IS ADJUSTABLE UP AND DOWN TO GET THE CORRECT SETTING AND IS FASTENED IN POSITION WITH TWO -002 1/4-INCH SCREWS.
- 4 THE ROUTER IS LOCKED IN POSITION WITH A -004, 1/4-INCH SCREW.

**Figure 1. Router Holder, Adjustable (Sheet 1)**

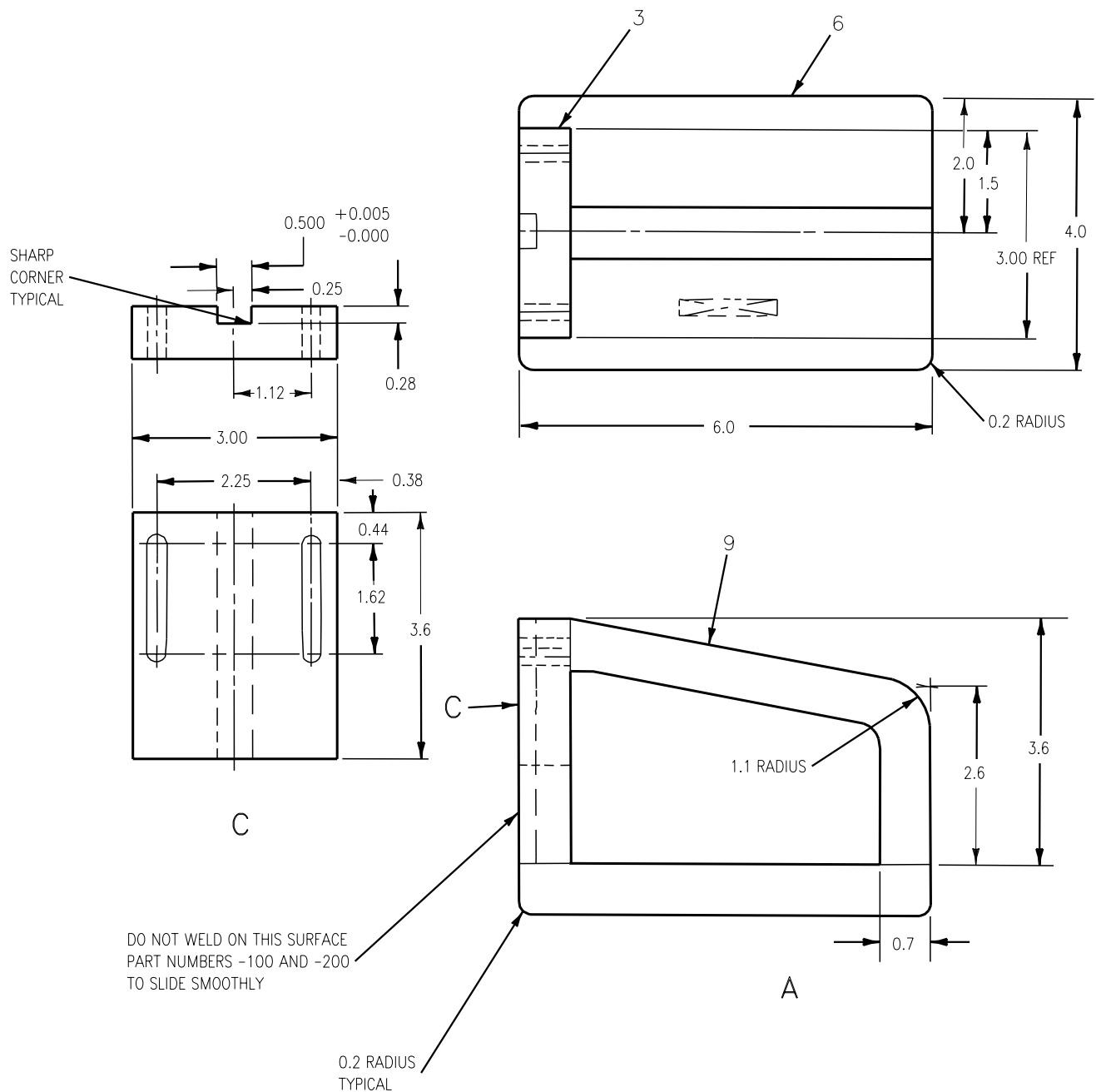


Figure 1. Router Holder, Adjustable (Sheet 2)

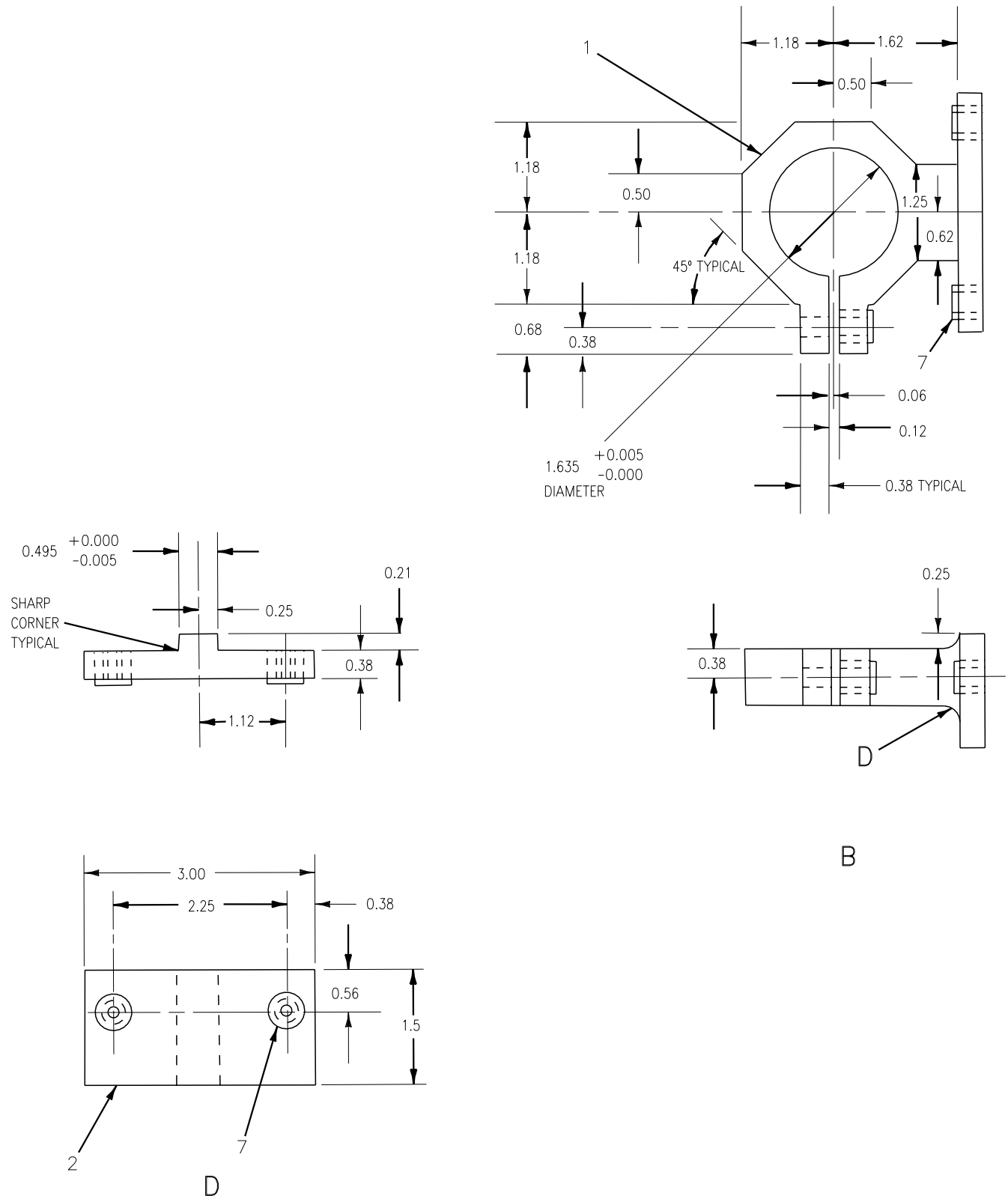


Figure 1. Router Holder, Adjustable (Sheet 3)

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## INTERMEDIATE AND DEPOT MAINTENANCE

### STRUCTURE REPAIR

#### TYPICAL REPAIR

#### TITANIUM PATCH FABRICATION

This WP supersedes WP006 03, dated 1 July 1998.

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### Reference Material

None

### Alphabetical Index

None

### Record of Applicable Technical Directives

None

1. Procedures have been deleted. Titanium patch fabrication for metallic structure repairs requires depot engineering disposition.





## ORGANIZATIONAL, INTERMEDIATE, AND DEPOT MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ALUMINUM, CARBON EPOXY AND TITANIUM PATCH PREPARATION, INSTALLATION AND REMOVAL

## Reference Material

General Composite Repair.....	NAVAIR 01-1A-21
Structure Repair, General Information .....	A1-F18AC-SRM-200
SK340-00192, Adhesive Comb .....	WP 004 39
Structure Repair, Typical Repair.....	A1-F18AC-SRM-250
Storage, Preparation and Handling Procedures for Structural Adhesives.....	WP 003 00
Heating Equipment Setup and Cure of Structural Adhesives.....	WP 004 00
Drying and Fluid Removal Procedures .....	WP 005 00
Aluminum Patch Fabrication.....	WP 006 01
Nondestructive Inspection.....	A1-F18AC-SRM-300
Nondestructive Inspection Index.....	WP 001 01

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## Record of Applicable Technical Directives

None

## 1. DESCRIPTION.

## NOTE

The drying procedures previously contained in this work package are now contained in WP 005 00.

2. This work package contains procedures for paint removal from part surface and preparation, installation and removal of bonded patches for aluminum and composite structures. Flow diagrams describing bonded patch installation and removal procedures are shown in figures 1 through 4.

## NOTE

If elevated temperature curing of structural adhesives is to be carried out and uncertainty exists (e.g. repair over substructure or near edge of panel) with temperature distribution seek engineering disposition for thermocouple and heater blanket layout.

## 3. PAINT AND PRIMER REMOVAL FROM PART SURFACE.

## Support Equipment Required

Part Number or Type Designation	Nomenclature
OO-S-101	Sander, Oscillating Pad, Pneumatic, Portable

## Materials Required

## NOTE

Alternate item specifications or part numbers are shown indented.

Specification, or Part Number	Nomenclature
E-007	Gloves, Surgeons
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning
ANSI B74.18 GRIT 150 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive
855 1 IN	Tape, Pressure Sensitive
D 1153	Methyl Isobutyl Ketone, Analyzed Reagent

## 4. PAINT AND PRIMER REMOVAL FROM ALUMINUM PART SURFACE.

a. Mask area, on part surface, 2 inches past repair area using pressure sensitive tape. Also mask any areas where part surface has been punctured or any other areas, on part or aircraft, to omit ingress of contaminants generated by paint removal procedure.

## WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

## NOTE

Before paint removal, gross contamination shall be removed from the masked area using solvent and wipe cloth.

b. Wearing clean disposable gloves, abrade paint using hand sanding or orbital sander within paint removal area commencing with 150 grit aluminum oxide abrasive paper and changing to 240 grit aluminum oxide paper when primer is exposed.

c. Vacuum clean paint removal area to remove sanding dust. Wipe area with clean, dry wipe cloth as required to identify paint and primer removal.

d. Repeat steps b and d until no further paint or primer appears on the part surface within paint removal area. Remove pressure sensitive tape.

## 5. PAINT AND PRIMER REMOVAL FROM CARBON EPOXY PART SURFACE.

a. Mask area, on part surface, two inches past repair area using pressure sensitive tape. Also mask any areas where part surface has been punctured or any other areas, on part or aircraft, to omit ingress of contaminants generated by paint removal procedure.

## WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations

## NOTE

Before paint removal, gross contamination shall be removed from the masked area using solvent and wipe cloth.

## CAUTION

Do not use chemical strippers for paint removal on composites. Do not sand into laminate when removing paint. Black residue indicates sanding into laminate and carbon fiber is being removed.

b. Wearing clean disposable gloves, remove paint from part surface by hand sanding or with orbital sander. Use 150 grit abrasive paper initially. Vacuum area frequently to reduce build up on the abrasive paper. Visually inspect abrasive paper for sanding residue build up and replace as required.

## NOTE

Some part surfaces are painted with dark colored primer making primer detection difficult. Some part surfaces do not contain primer.

c. When primer is visually detected on the part, change to 180 to 240 grit abrasive paper and continue the sanding operation until the most of the primer is removed. Some primer may remain in peel ply impression recesses on the laminate surface after sanding.

d. Vacuum clean paint removal area to remove sanding dust. Wipe area with clean, dry wipe cloth to remove sanding residue. Do not use solvent.

## 6. ALUMINUM PATCH INSTALLATION AND REMOVAL FOR ALUMINUM FACED HONEYCOMB SANDWICH STRUCTURE AND ALUMINUM SKIN.

## NOTE

For honeycomb core sandwich panels, fabrication, preparation and installation of core plug or fill of cavity damage with adhesive must be completed before going to next step.

## 7. ALUMINUM STRUCTURE AND PATCH PREPARATION FOR BONDING.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
GGG-K-00450 TY1CL2ST1ST2-ST3ST4 HG	Knife, Craftsman's Heater, Gun Type, Electric
Commercial Availability OO-S-101	Recirculating Air Oven
74D110165-1001 Applicable Repair Set Equipment:	Sander, Oscillating Pad, Pneumatic, Portable
74D110165-2001	Repair Set, Temperature/Vacuum Control, Composite Structure Assembly
74D111252-1011	Temperature Sensor Assembly
1935AS100-1 (alternate) —	Temperature/Vacuum Control Repair Set Heat Lamp, Infrared, 115V, 250 Watt

### Materials Required

Specification, or Part Number	Nomenclature
E-007 CCCC440TY1CL1 RYMPLE CLOTH-301-PURIFIED	Gloves, Surgeons Cloth, Cheesecloth Cloth, Cleaning
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive

### Materials Required (Continued)

Specification, or Part Number	Nomenclature
855 1 IN	Tape, Pressure Sensitive
470 D 1153	Tape, Acid Resistant Solvent, Methyl Isobutyl Ketone (MIBK), AR Grade Reagent
MIL-B-121 TYPE 2 GRADE A CLASS 1 MILB131CLASS1	Barrier Material (Kraft Paper) Barrier Material, Water Vapor Proof
Commercial Availability DISTILLEDWATER COMMERCIAL	Squeeze bottles Distilled Water
222555	Metal Cleaner Pasajel 105
ZZ-G-381 TYPE 1 STYLE 1	Gloves, Chemical
MS36253-3 H-B-695 TYPE1 GRADEA SIZE 1.500	Litmus Paper, Blue Brush, Paint
BR127 100SG 30 TR 200SG 40 TR	Primer, Adhesive Plastic Sheet (Release Film)

## NOTE

Operate 1935AS100-1 temperature/vacuum control unit per NAVAIR 17-1-131 Manual. Operate 74D110165-1001 repair set per (WP004 00).

a. Mask an area, on part surface, two inches past the repair area using acid resistant tape.



Avoid excessive abrasion when removing cladding from thin aluminum skins.

b. Inspect surface per (WP006 01) for presence of cladded surface. If cladding exist, wearing clean disposable gloves, abrade surface using 180-240 grit paper and hand sanding or orbital sander until removal or absence of cladding is confirmed by inspecting.

c. Fabricate repair patch(es) per (WP006 01).

## WARNING

Methyl isobutyl ketone (MIBK) is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

## CAUTION

Only uncontaminated analytical reagent (AR) grade solvent, dispensed from a squeeze bottle, should be used for surface preparation work.

The effectiveness of further surface preparation depends directly on the thoroughness of this step. The solvent degreasing process must be thoroughly completed.

d. Wearing clean disposable latex gloves thoroughly solvent degrease the surface using solvent and wipe cloth (change gloves after 5 minutes or sooner if contaminated). A clean wipe cloth must be used for each wipe. Continue until wipe cloth remains clean.

## NOTE

Exposure times between surface preparation steps are to be kept below the times listed in figure 5 of this work package. If a break exceeds the specified limits during any procedure, the process must be repeated from the start of the solvent degreasing stage.

Repairs done outside a controlled environment must have precautions taken to prevent contamination to bonding surface. Erect an enclosure around the repair site to prevent contamination where practical.

e. Using an orbital sander and 180 grit abrasive paper, carefully abrade patch and/or part bonding surface until a uniform matte surface is obtained. Make sure of 100 % coverage.

## CAUTION

Do not solvent clean after abrasion, as contamination of the surface will result in bad bond integrity.

f. Using clean dry wipe cloths, wipe the surface to remove sanding debris. Replacing the wipe cloths as required, continue to wipe the surface until no trace of contamination is observed on the wipe cloths.

## CAUTION

Be careful not to scratch surface with knife blade when trimming tape. Any scratches past negligible limits shall be blended and surface recleaned.

g. Seal repair cavity using acid resistant tape. Apply tape over the hole without stretching. Use knife to trim tape overlap to 0.05 of an inch.

## WARNING

Metal cleaner (Pasajel 105) will cause serious injury if not handled correctly. Wear clean chemical gloves, eye and respiratory protection and approved protective clothing.

## CAUTION

Metal cleaner (Pasajel 105) is acidic and will cause corrosion. Measures must be taken to contain the acid and wash products. Clean up all spills immediately, and confirm removal by the use of litmus paper.

h. Stir the pasajel 105 in the container to make sure the gel is the correct consistency before use.

## NOTE

If heat lamps are used, put them at the correct distance to get the required temperature on the patch and/or part bonding surface. Verify temperature using thermocouples before applying Pasa-jell 105. Heat lamps should not be moved after correct location has been determined.

i. For heat lamps, refer to NAVAIR 01-1A-21, Section VIII, Miscellaneous Repair Equipment, Table. If heat lamps are used, refer to NAVAIR 01-1A-21, Repair Materials, Methods for Applying Pressure and Heat to Cure Bonded Repairs, Heat Lamps for usage instructions. Do a heat search of the repair area to determine the correct location of the heat lamps, see below.

(1) Position temperature sensor assembly near the center of the repair. Tape in position with pressure sensitive tape. Adjust controller to get all thermocouples within required temperature range.

(2) Set up the heat lamp and raise temperature to  $140 \pm 20^{\circ}\text{F}$ . Adjust the heat lamp as required to get the correct temperature range. Remove the temperature sensor assembly from the repair area.

(3) Heat part surface to  $140 \pm 20^{\circ}\text{F}$  using heat lamps or an air circulating oven.

j. Wearing clean chemical gloves and other recommended PPE, apply a uniform coating of Pasa-jell 105 over the surface using an acid brush.

k. Continually stir the gelled surface for 8-12 minutes to get contact between clean gel and the metal surface maintaining  $140 \pm 20^{\circ}\text{F}$ . Prevent any area from discoloring or becoming dry by applying new paste to the area.

## NOTE

Be careful during rinsing and water break test to prevent inadvertent water entry into honeycomb sandwich parts.

l. After 8-12 minutes have elapsed, remove gel using a piece of clean wipe cloth saturated with distilled water. Without contaminating other areas of the structure, flush the area with distilled water for 2 minutes to remove acid paste. Continue to

wipe or flush to remove the material until no trace remains.

m. Confirm the removal of acid by use of clean litmus paper. Using a new saturated wipe cloth, wipe surface, and insert litmus into the wipe cloth. If the litmus paper turns pink, continue flushing or wiping the surface with water and clean wipe cloth.

n. Do water break test in accordance with the noted procedures.

(1) Wearing clean disposable latex gloves thoroughly wet the surface with distilled deionized water, covering the complete bonding surface. Water should be sprayed or squirted on the surface. Do not brush apply or pour.

(2) Allow to stand for 15 seconds. Observe for any area where the water breaks from the surface. If the water break fails, the complete surface preparation process must be repeated from step 7d using new materials. Surface preparation process may be repeated no more than twice. If a water break test fails for a third time, seek CFA engineering disposition.

(3) Thoroughly dry the surface for 30 minutes using a hot air gun, recirculating air oven or other approved hot air source which raises the temperature to  $150 \pm 10^{\circ}\text{F}$ . Use moderate airflow to dry the surface. The water should evaporate from the surface instead of breaking in droplets. Do not use airflow to force droplets across surface.

o. Remove acid resistant tape covering repair cavity.



## WARNING

Adhesive primer is highly flammable and toxic. Do not use near open flame or sparks. Use only in well ventilated areas. Primer must be stirred and mixed before use. Solids in primer will settle out quickly. Stir primer continuously while being used.

## NOTE

Apply primer as soon as possible after para 7o.(3) drying step or cover surface with clean wax-free kraft paper taped in position. If primer is not applied within 1 hour of para 7o.(3), the whole surface preparation process must be repeated starting with para 7d.

Be careful not to apply primer over repair cavity.

p. Carry out hand cloth wipe application of adhesive primer BR 127. Using a clean dry cheesecloth make a pad for applying primer. Moisten pad with primer and wipe surface to be bonded lightly with pad. Apply primer evenly. Primer should have a light green appearance on the

surface to get the correct dry film thickness of between 0.0001 and 0.0005 of an inch. A dark green color and/or streaks of dark green color are unacceptable.

q. Allow primer to dry at ambient temperature for 30 minutes.

r. Cure primer in an air oven if possible or by use of a vacuum bag and heat blankets per WP 004 00 at 240°F ±20°F for 60 minutes. If using heat blankets, applying a layer of release film over the surface before installing heat blanket to prevent contamination.

s. Remove release film (if installed) and inspect primer color for required thickness (0.0001-0.0005 of an inch). If little to no primer color is visible (thickness less than 0.0001 of an inch) repeat complete primer application process being careful to reapply a light coat of primer. If the primer is dark green or contains dark green streaks (thickness greater than 0.0005 of an inch) remove the primer by abrading the surface with 240 grit abrasive paper and repeat the complete surface preparation and primer application process from 7d to 7s.

t. Protect the part and/or patch surface using release film. Patches which are not bonded within four hours must be heat sealed in a water vapor proof bag.





**NOTE**

Components prepared and primed and which are to be used with honeycomb core repairs must continue immediately to Aluminum Patch Installation, para 8 this WP, or be covered with clean wax free kraft paper taped in position. Patch must be bonded to the component within 4 hours or the whole surface preparation process must be repeated.

Patches which have been prepared and primed may be kept indefinitely provided they have been heat sealed in a water vapor proof bag.

**8. ALUMINUM PATCH INSTALLATION.**

a. Select adhesive per part specific structural repair manual or damage engineering disposition. Refer to WP 003 00 for preparation and handling procedures.

**NOTE**

Surface preparation of aluminum surfaces and priming of component surface must have been done before patch installation.

**9. Aluminum Patch Installation Using FM300 or FM300-2 Film Adhesive.****Support Equipment Required**

Part Number or Type Designation	Nomenclature
GGG-S-00278	Shears, Straight Trimmers
SK340-00192, NADEP NI Cage No. 91145	Adhesive Comb

**Materials Required****NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
74K000004	Adhesive Repair, Staged Packaged Kit, FM300
135027	Adhesive Repair, Staged Packaged Kit, FM300-2
MIL-G-3866, TYPE 1 Small or Medium E-007 855 1 IN	Gloves, Cotton  Gloves, Surgeons Tape, Pressure Sensitive
ANSI B74.18 GRIT 150 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
CCCC440TY1CL1 RYMPLE CLOTH- 301-PURIFIED	Cloth, Cheesecloth Cloth, Cleaning

**NOTE**

Only FM300 adhesive 74K000004 staged, embossed adhesive or FM300-2 staged, embossed adhesive should be used (refer to WP 003 00 for handling procedures).

a. Primed aluminum patches and mating surface must be solvent cleaned before application per 7d.

**NOTE**

Remove kit of film adhesive FM300 or FM300-2 from frozen storage, be sure adhesive shelf life has not expired and allow adhesive to get to room temperature per WP 003 00 before opening kit. FM300-2 is the preferred film adhesive.

b. Wearing clean disposable latex gloves and using the patch as a template cut a layer of film adhesive 0.25 inch larger than patch periphery.

**NOTE**

FM300 or FM300-2 film adhesive kits are embossed with a honeycomb core imprint on one side. Make sure embossed surface of adhesive is to mate with part surface.

c. Remove barrier material from embossed side of adhesive and position centrally over part surface. Press firmly to make sure adhesive is located on part surface.

d. Remove remaining barrier material and position patch centrally over repair area. Tape patch in place using pressure sensitive tape.

**NOTE**

Install vacuum bag/heater blanket assembly over repair as soon as possible. Cure of the repair may be delayed by up to 24 hours provided vacuum is maintained above 20 inches of mercury.

e. Cure adhesive per WP 004 00.

f. After repair has cured, sand edges of patch lightly using 180 grit abrasive paper.

g. Remove dust by wiping with clean, dry wipe cloth.

h. Carry out NDI of all areas subjected to elevated cure temperature to verify bond line integrity, (A1-F18AC-SRM-300, WP 001 01). Also for sandwich panels, the repair area plus a distance of 12 inches past the heat blanket(s) must be inspected for node bond failure and skin to core disbands.

i. Refer to part specific structural repair manual for part finishing and aerodynamic smoothness requirements.

### 10. Aluminum Patch Installation using EA9321 A/B Paste Adhesive.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
SK340-00192 NADEP NI Cage No. 91145	Adhesive Comb
GGG-S-00278	Shears, Straight Trimmers

### Materials Required

**NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
GG-D-226 EA9321 855 1 IN	Depressor, Tongue Paste Adhesive Tape, Pressure Sensitive
Pattern 30 MIL-G-3866 TYPE 1 E-007	Cloth, Nylon Scrim Gloves, Cotton Gloves, Surgeons
ANSI B74.18 GRIT 150 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
CCCC440TY1CL1 RYMPLE CLOTH- 301-PURIFIED	Cloth, Cheesecloth Cloth, Cleaning

**WARNING**

Adhesive is toxic. Avoid breathing of vapors and contact with skin and eyes. Wear skin, eye and respiratory protection.

a. Wearing clean gloves and using the patch as a guide, cut a piece of scrim cloth 0.25 inch larger than patch periphery.

**NOTE**

Vacuum pressure must be applied to the repair assembly within 30 minutes of mixing of the adhesive.

- b. Prepare adhesive per instructions in WP 003 00.

**NOTE**

Primed aluminum patches and mating surface must be solvent cleaned before application per 7d.

- c. Apply a thin layer of adhesive to repair surface using a clean tongue depressor. Spread adhesive at least 1/4 inch larger than patch to be bonded and use adhesive comb to remove excess adhesive on repair surface. For adhesive comb information (A1-F18AC-SRM-200, WP 004 39).

- d. Apply scrim cloth to paste adhesive on part surface.

- e. Apply a thin layer of adhesive to patch surface and use adhesive comb to remove excess adhesive from patch surface.

- f. Center patch over part surface, press patch firmly and tape patch in position using pressure sensitive tape.

- g. Remove excess adhesive from patch periphery.

- h. Cure adhesive per WP 004 00.

- i. After repair has cured, sand edges of patch lightly using 180 grit abrasive paper.

- j. Remove dust by wiping with clean, dry wipe cloth.

- k. Carry out NDI of repair area to verify bond line integrity (A1-F18AC-SRM-300, WP 001 01).

- l. Refer to part specific structural repair manual for part finishing and aerodynamic smoothness requirements.

**11. ALUMINUM PATCH REMOVAL****Support Equipment Required**

Part Number or Type Designation	Nomenclature
Commercial Availability OO-S-101	Rubber Mallet  Sander, Oscillating Pad, Pneumatic, Portable

**Materials Required**

Specification or Part Number	Nomenclature
Commercial Availability Commercial Availability Commercial Availability	Gloves, Heat Protective Dry Ice  Wedges, Wood, Annealed Brass, O Cond Aluminum Alloy
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive

**WARNING**

Dry ice is extremely cold and may cause severe burns. Wear protective gloves and clothing and faceshield. Do not use dry ice in confined spaces as asphyxiation may occur.

- a. Pack the bond area with dry ice and allow to stand for five minutes.

**CAUTION**

Do not use aggressive patch removal methods on honeycomb sandwich structure. Excessive force may damage the skin to core bond.

- b. Using a rubber mallet and wedges carefully force the wedges into the bond line at the edges of

the bonded member. Relying on the reduced peel strength of the adhesive, gently pry the patch from the surface. Several wedges may be required, depending on the condition of the bond. Repeated freezing of the area may be required as the peel resistance changes. Continue until patch is removed.

c. Wearing breathing, eye and skin protection carefully remove remaining adhesive from the surface by sanding using 180 to 240 grit abrasive paper.

d. Do nondestructive inspection on structure for skin to core disbonds in the area of the removed patch (A1-F18AC-SRM-300, WP 001 01). If damage is found, refer to part specific work package for classification of damage and repair.

## 12. CARBON EPOXY AND TITANIUM PATCH INSTALLATION AND REMOVAL FOR CARBON EPOXY STRUCTURES.

### NOTE

For honeycomb core sandwich panels, fabrication, preparation and installation of core plug or fill of cavity damage with adhesive must be completed before going to next step.

## 13. PREPARATION OF CARBON EPOXY PART AND/OR PATCH SURFACE FOR BONDING.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
4SE01754	Hepa Filter Vacuum Cleaner
HG	Heater, Gun Type, Elect
Commercial Availability	Recirculating Air Oven

### Materials Required

#### NOTE

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
MIL-G-3866 TYPE 1	Gloves, Cotton
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning
ANSI B74.18 GRIT 80 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 120 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 240 SILICON CBD	Paper, Abrasive
855 1 IN	Tape, Pressure Sensitive
MIL-B-121 TYPE 2 GRADE A CLASS 1	Barrier Material (Kraft Paper)
MILB131CLASSI	Barrier Material

a. Mask an area on part surface two inches past the repair area using pressure sensitive tape.

b. Select patch(es) per parts specific structure repair manual and remove peel ply from both sides (if applicable).

**WARNING**

Sanding carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Table 10-2.

**CAUTION**

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract dust away from aircraft and electrical equipment.

Do not solvent clean after abrasion, as contamination of the surface will result in bad bond integrity.

c. Wearing clean disposable gloves and using 150 to 180 grit abrasive paper, abrade the complete area of the bonding surface. Remove most of peel ply impression if present. If peel ply impression not present sand until presence of black dust. Minimize removal of load carrying fibers. Make sure 100 % coverage of the part surface during sanding.

d. Using clean dry wipe cloth, wipe the surface to remove sanding residue. Replacing the wipe cloths as required, continue to wipe the surface until no trace of contamination is observed on wipe cloths. For each wipe use a new, clean dry wipe cloth.

**NOTE**

Components and patches which have been prepared and which are to be used with honeycomb core repairs must continue immediately to Carbon Epoxy and Titanium Patch Installation, paragraph 5c this WP, or be covered with clean wax free kraft paper taped in place. Patch must be bonded to the component within 4 hours or else patch must be redried per WP 005 00 and light hand sand using 180 grit abrasive paper.

e. Continue to patch installation per paragraph 15 this work package.

**14. PREPARATION OF TITANIUM PATCH SURFACE FOR BONDING.****Support Equipment Required**

None

**Materials Required****NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
MIL-G-3866 TYPE 1	Gloves, Cotton
E-007	Gloves, Surgeons
CCCC440TY1C1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning
D 1153	Methyl Isobutyl Ketone, Analyzed Reagent
MIL-B-121 TYPE 2	Barrier Material
GRADE A CLASS 1	(Kraft Paper)
Commercial	Squeeze Bottles
Availability	

a. Select prepared patch per parts specific structural repair manual and remove from packaging.

**WARNING**

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

b. Wearing clean disposable latex gloves thoroughly solvent degrease both surfaces of the patch using solvent and wipe cloth (change gloves after 5 minutes or sooner if contaminated). A clean wipe cloth must be used for each wipe. Continue until wipe cloth remains clean.

c. From this point forward handle patch with clean disposable gloves.

**NOTE**

Components and patches which have been prepared and which are to be used with honeycomb core repairs must go immediately to Carbon Epoxy and Titanium Patch Installation, step 15 this WP, or be covered with clean wax free kraft paper taped in place. Patch must be bonded to the component within 4 hours or whole surface preparation process must be repeated.

d. Continue to Patch Installation step 15 this work package.

**15. CARBON EPOXY AND TITANIUM PATCH INSTALLATION.**

a. Select adhesive per part specific structural repair manual or damage engineering disposition. Refer to WP 003 00 for preparation and handling procedures.

**NOTE**

Surface preparation of carbon epoxy/titanium part and/or patch surface and priming of component surface (if required) must have been done before patch installation or surface exposure times listed in figure 5 will be violated.

**16. Installation of Precured Carbon Epoxy, Precured Wet Lay-up and Titanium Patches Using FM300 or FM300-2 Film Adhesive.****Support Equipment Required**

Part Number or Type Designation	Nomenclature
GGG-S-00278	Shears, Straight Trimmers

**Materials Required****NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
74K000004	Adhesive Repair, Staged Packaged Kit, FM300
135027	Adhesive Repair, Staged Packaged Kit, FM300-2
MIL-G-3866 TYPE 1 Small or Medium	Gloves, Cotton
E-007	Gloves, Surgeons
855 1 IN	Tape, Pressure Sensitive
ANSI B74.18 GRIT 150 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 180 SILICON CBD	Paper, Abrasive
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH-301-PURIFIED	Cloth, Cleaning



**NOTE**

Only FM300 adhesive 74K000004 staged, embossed adhesive or FM300-2 staged, embossed adhesive should be used (refer to WP 003 00 for handling procedures).

a. Wearing clean disposable gloves and using the patch as a template cut a layer of film adhesive 0.25 inch larger than patch periphery. If stacked patches are required, cut additional layers of film adhesive 0.25 larger than each succeeding patch in the stack.

**NOTE**

FM300 or FM300-2 film adhesive kits are embossed with a honeycomb core imprint on one side. Make sure embossed surface of adhesive is to mate with part surface.

The bond surface of the carbon /epoxy patch is the flat surface not containing the taper.

When locating precured carbon/epoxy patches locate low bending resistance direction by hand-flexing patch. Place thumbs 180 degrees apart on top of patch, flex patch around its periphery until low resistance point is found. Install patch on curved surfaces with low resistance direction matching curvature. For precured wet layup patches refer to part specific work package for alignment. When more than one patch is required, place the largest diameter patch against the repair surface and stack patches in succeeding smaller diameters.

b. Remove barrier material from embossed side of adhesive and position centrally over part surface. Press firmly to make sure adhesive is located on part surface.

c. Remove remaining barrier material and position patch centrally over repair area. If carrying out a multiple patch layup, repeat steps 16b to 16c.

d. Tape patch(es) in place using pressure sensitive tape.

**NOTE**

Install vacuum bag/heat blanket assembly over repair per WP 004 00 as soon as possible. Cure of the repair may be delayed by up to 24 hours provided vacuum is maintained above 20 inches of mercury.

e. Cure adhesive per instructions in WP 004 00.

f. After repair has cured, sand edges of patch lightly using 180 grit abrasive paper.

g. Remove dust by wiping with clean, dry wipe cloth.

h. Do NDI of all areas subjected to elevated cure temperature to verify bond line integrity, (A1-F18AC-SRM-300, WP 001 01). Also for sandwich panels, the repair area plus a distance of 12 inches past the heater blanket(s) must be inspected for node bond failure and skin to core disbands.

i. Refer to part specific structural repair manual for part finishing and aerodynamic smoothness requirements.

### 17. Installation of Precured Carbon Epoxy, Precured Wet Lay-up and Titanium Patches using EA9321 A/B Paste Adhesive.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
SK340-00192	Adhesive Comb
GGG-S-00278	Shears, Straight Trimmers

### Materials Required

**NOTE**

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
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**Materials Required (Continued)****NOTE**

Alternate item specifications or part numbers are shown indented.

GG-D-226	Depressor, Tongue
EA9321	Paste Adhesive
855 1 IN	Tape, Pressure Sensitive
Pattern 30	Cloth, Nylon Scrim
MIL-G-3866 TYPE 1 Small or Medium	Gloves, Cotton
E-007	Gloves, Surgeons
ANSI B74.18 GRIT 150 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 180 SILICON CBD	Paper, Abrasive
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH-301-PURIFIED	Cloth, Cleaning

**WARNING**

Adhesive is toxic. Avoid breathing of vapors and contact with skin and eyes. Wear skin, eye and respiratory protection.

a. Wearing clean gloves and using the patch as a guide, cut a piece of scrim cloth 0.25 inch larger than patch periphery. If stacked patches are required for the repair, cut separate layers of scrim cloth 0.25 inches larger than each succeeding patch in the stack.

**NOTE**

Vacuum pressure must be applied to repair assembly within 30 minutes of mixing of the adhesive.

b. Prepare adhesive per instructions in WP 003 00.

c. Apply a thin layer of adhesive to repair surface using a clean tongue depressor. Spread adhesive at least 1/4 inch larger than patch to be bonded and use adhesive comb to remove excess adhesive on repair surface.

d. Apply scrim cloth to paste adhesive on part surface.

**NOTE**

The bond surface of the carbon /epoxy patch is the flat surface not containing the taper.

When locating precured carbon/epoxy patches locate low bending resistance direction by hand-flexing patch. Place thumbs 180 degrees apart on top of patch, flex patch around its periphery until low resistance point is found. Install patch on curved surfaces with low resistance direction matching curvature. For precured wet layup patches refer to part specific work package for alignment.

When more than one patch is required, place the largest diameter patch against the repair surface and stack patches in succeeding smaller diameters.

e. Apply a thin layer of adhesive to patch surface and use adhesive comb to remove excess adhesive from patch surface.

f. Position patch with adhesive centrally over repair area. If carrying out a multiple patch layup, repeat steps 17c to 17f.

g. Remove excess adhesive from patch periphery.

h. Tape patch(es) in place using pressure sensitive tape.

i. Cure adhesive per instructions in WP 004 00.

j. After repair has cured, sand edges of patch lightly using 180 grit abrasive paper.

k. Remove dust by wiping with clean, dry wipe cloth.

l. Carry out NDI of repair area to verify bond line integrity. (A1-F18AC-SRM-300)

m. Refer to part specific structural repair manual for part finishing and aerodynamic smoothness requirements.

## 18. Installation of Cobonded Wet Layup Patches.



Use this process only when specified by a part specific work package.

**Support Equipment Required**

Part Number or Type Designation	Nomenclature
—	Marking Pen, Permanent Ink Adhesive Spreader
P.A-1, 3M Co, Cage No. 76381 GGG-S-00278	Shears, Straight Trimmers

**Materials Required****NOTE**

Alternate item specifications or part numbers are shown indented.

Specification, or Part Number	Nomenclature
W-133	Cloth, Graphite Woven
EA956 A/B	Resin/Adhesive
EA9396 A/B	Resin/Adhesive
855 1 IN	Tape, Pressure Sensitive
MIL-G-3866 TYPE 1 Small or Medium	Gloves, Cotton
E-007	Gloves, Surgeons
TEMP-R-GLAS6TB	Cloth, Coated
ANSI B74.18 GRIT 180 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 240 SILICON CBD	Paper, Abrasive
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH- 301-PURIFIED	Cloth, Cleaning

a. Cut enough dry woven carbon fiber cloth to make number of plies with required ply orientation for wet layup assembly as specified in applicable SRM work package or engineering disposition.

b. Tape one layer of non-porous release fabric (Teflon cloth) over a clean flat surface. Teflon cloth shall be cut larger than woven carbon fiber cloth.

**NOTE**

Vacuum pressure must be applied to the repair assembly within 30 minutes of mixing the adhesive.

Compute amount of resin required for patch being made. Approximately 48 grams of resin is required per square foot of cloth. To avoid potential exotherm or gelling of resin, mix only amount of material to be used within 40 minutes (20 minutes for ambient temperature in excess of 90°F).

c. Prepare resin/adhesive per WP 003 00. EA9396 is the preferred adhesive for use in this process.

d. Apply a layer of resin/adhesive to Teflon cloth one inch past the periphery of patch.

e. Position layer of dry woven carbon fiber cloth on resin/adhesive.

f. Pour resin/adhesive to dry side of dry woven carbon fiber cloth.

g. Position another layer of Teflon cloth over saturated dry woven carbon fiber cloth.

h. Work resin/adhesive into dry woven carbon fiber cloth using plastic spreader. Woven cloth must be evenly saturated with resin adhesive. Inspect for dry spots and spread the resin to be sure saturation of dry cloth.

i. Mark the shape, orientation and ply number on the non-porous release cloth covering each patch ply. Refer to NAVAIR 01-1A-21, Section VIII, Miscellaneous Equipment, table.

j. Cut specified number of plies to required size and ply orientation.

k. Apply a thin layer of resin/adhesive to part bonding surface one inch past periphery of patch.

**NOTE**

Refer to part specific work package for ply orientation and stacking.

l. Remove one layer of Teflon from wetted ply and dispose.

m. Making sure of the correct ply orientation and location on the part, position wetted ply on part surface.

n. Remove second layer of Teflon cloth from surface of installed ply and dispose.

o. Repeat process for all required saturated plies.

**NOTE**

Fabricated patch must be subjected to a two hour room temperature dwell before elevated temperature cure.

p. Cure adhesive per WP 004 00.

q. After repair has cured, sand edges of patch lightly using 180 grit abrasive paper.

r. Remove dust by wiping with clean, dry wipe cloth.

s. Carry out NDI of repair area to verify bond line integrity.

t. Refer to part specific structural repair manual for part finishing and aerodynamic smoothness requirements.

### 19. CARBON EPOXY OR TITANIUM PATCH REMOVAL FROM CARBON EPOXY STRUCTURE.

#### Support Equipment Required

Part Number or Type Designation	Nomenclature
GGG-K-00450	Knife, Craftsman's
TY1ST1ST2-ST3ST4	
74D110172-1001	Core Knife
Commercial	Needle Nose Pliers
Availability	

#### Support Equipment Required (Continued)

Part Number or Type Designation	Nomenclature
3156AS100	Generic Composite Repair Tool Kit

#### Materials Required

**NOTE**

Alternate item specifications or part numbers are shown indented.

Specification, or Part Number	Nomenclature
ANSI B74.18 GRIT 150	Paper, Abrasive
SILICON CBD	
ANSI B74.18 GRIT 180	Paper, Abrasive
SILICON CBD	
ANSI B74.18 GRIT 240	Paper, Abrasive
SILICON CBD	
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH-301-PURIFIED	Cloth, Cleaning
MIL-G-3866 TYPE 1	Gloves, Cotton
Small or Medium	
—	Abrasive Disk, Silicon Carbide, 80 Grit

**WARNING**

Wear protective gloves during removal operation.

**CAUTION**

To avoid damage, do not pry patch using surrounding skin as supporter. Remove only small part of patch at one time.

Be careful not to damage skin area surrounding patch.

a. Removal of carbon epoxy or titanium patch by prying method.

(1) Using an X-acto knife, gradually work up small part of patch.

(2) Slide sharp knife under patch. Pull off sections of patch using needle nose pliers.

(3) Sand residual adhesive using 180 grit abrasive paper. Wipe area with clean, dry wipe cloth.

(4) Sand smooth with 240 grit abrasive paper.

(5) Carry out NDI of repair area to identify damage, if any, caused during patch removal procedure.

(6) Refer to part specific structural repair manual for next procedure.

b. Carbon epoxy patches may also be removed by sanding as noted below:

(1) Sand carbon epoxy patch until adhesive is visible using 90° router motor and 80 grit abrasive disk. Refer to NAVAIR 01-1A-21, Section VIII, Cutters/Sanding Equipment, table.

(2) Sand residual adhesive using 180 grit abrasive paper. Wipe area with clean, dry wipe cloth.

(3) Sand smooth with 240 grit abrasive paper.

(4) Carry out NDI of repair area to identify damage, if any, caused during patch removal procedure.

(5) Refer to part specific structural repair manual for next procedure.

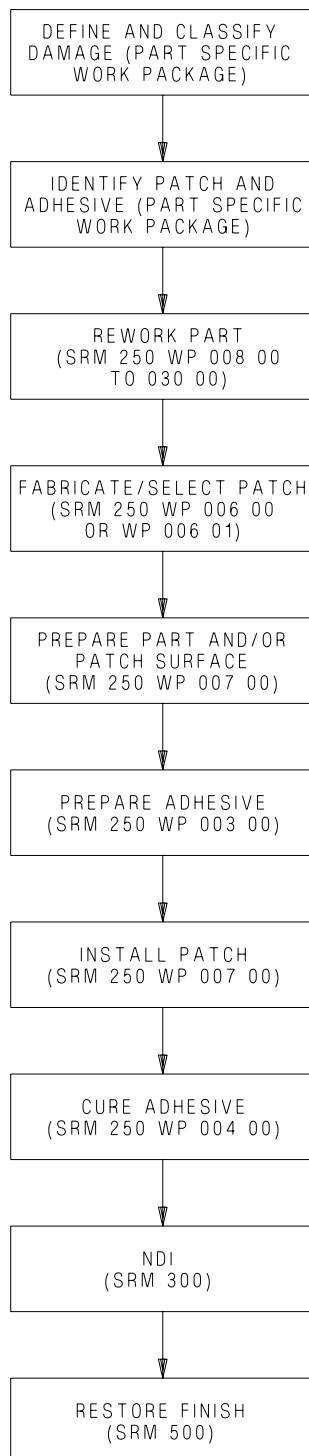


Figure 1. Generic Flow Chart for Bonded Repairs

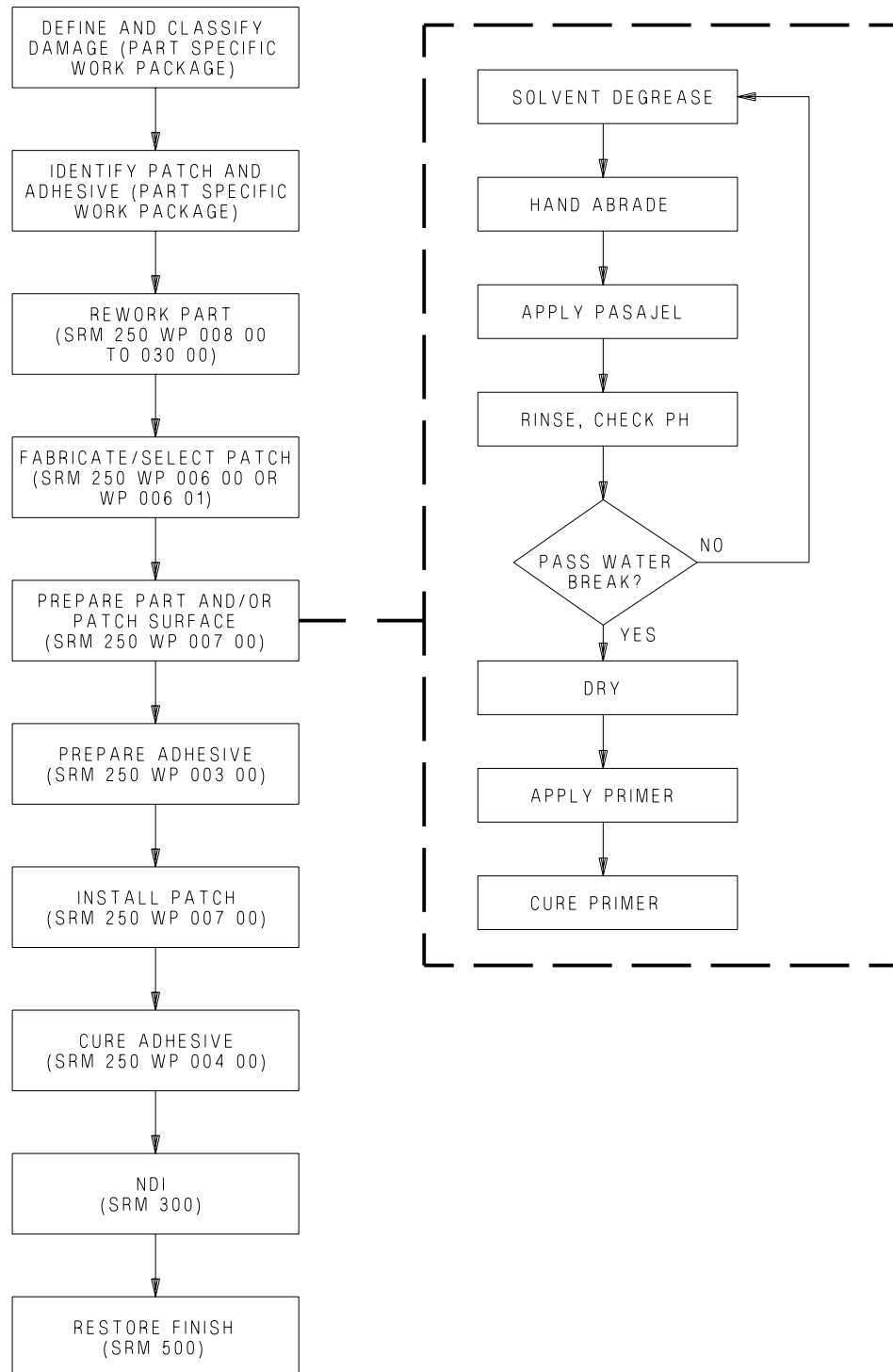


Figure 2. Surface Preparation Aluminum Surfaces

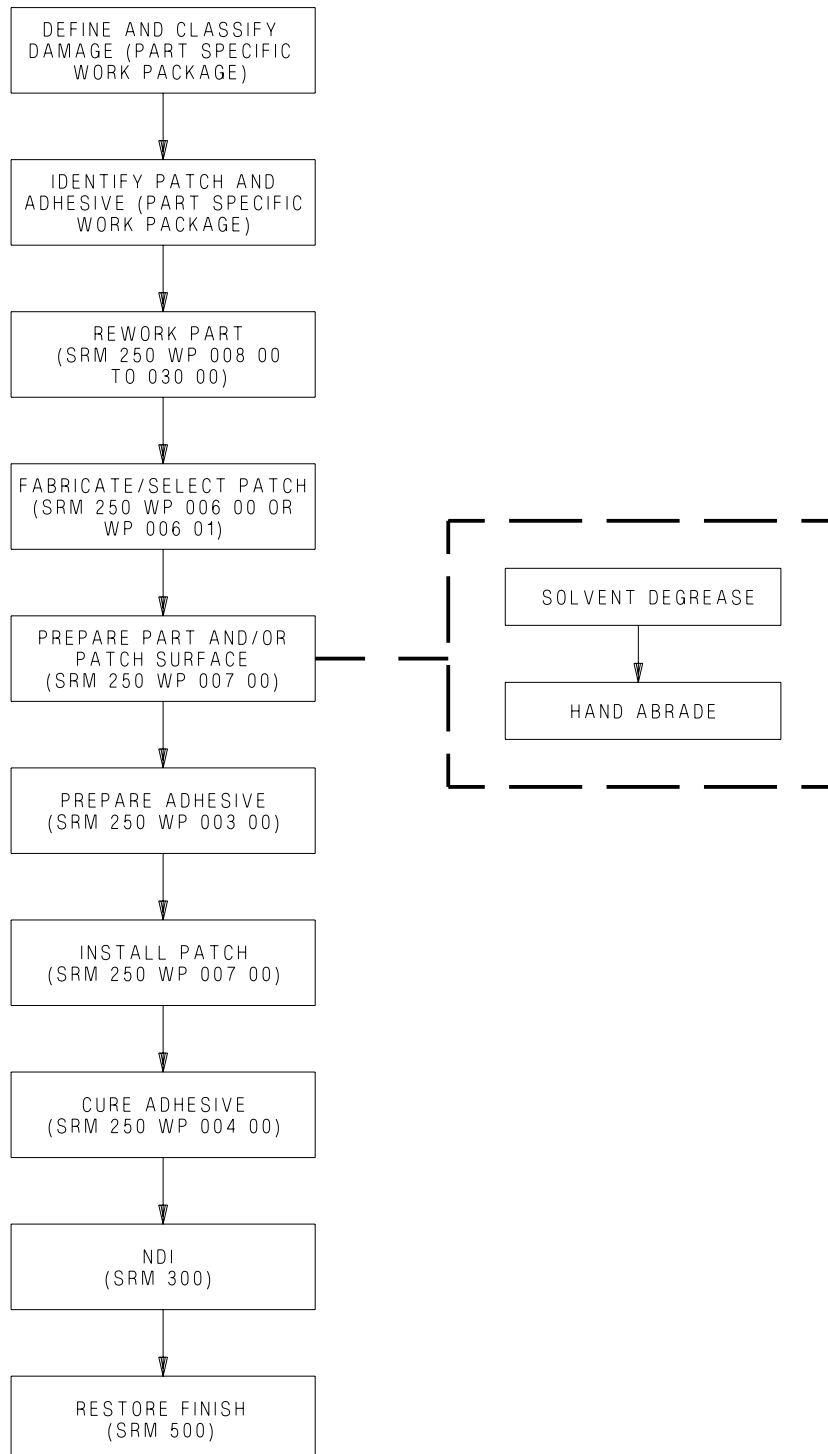
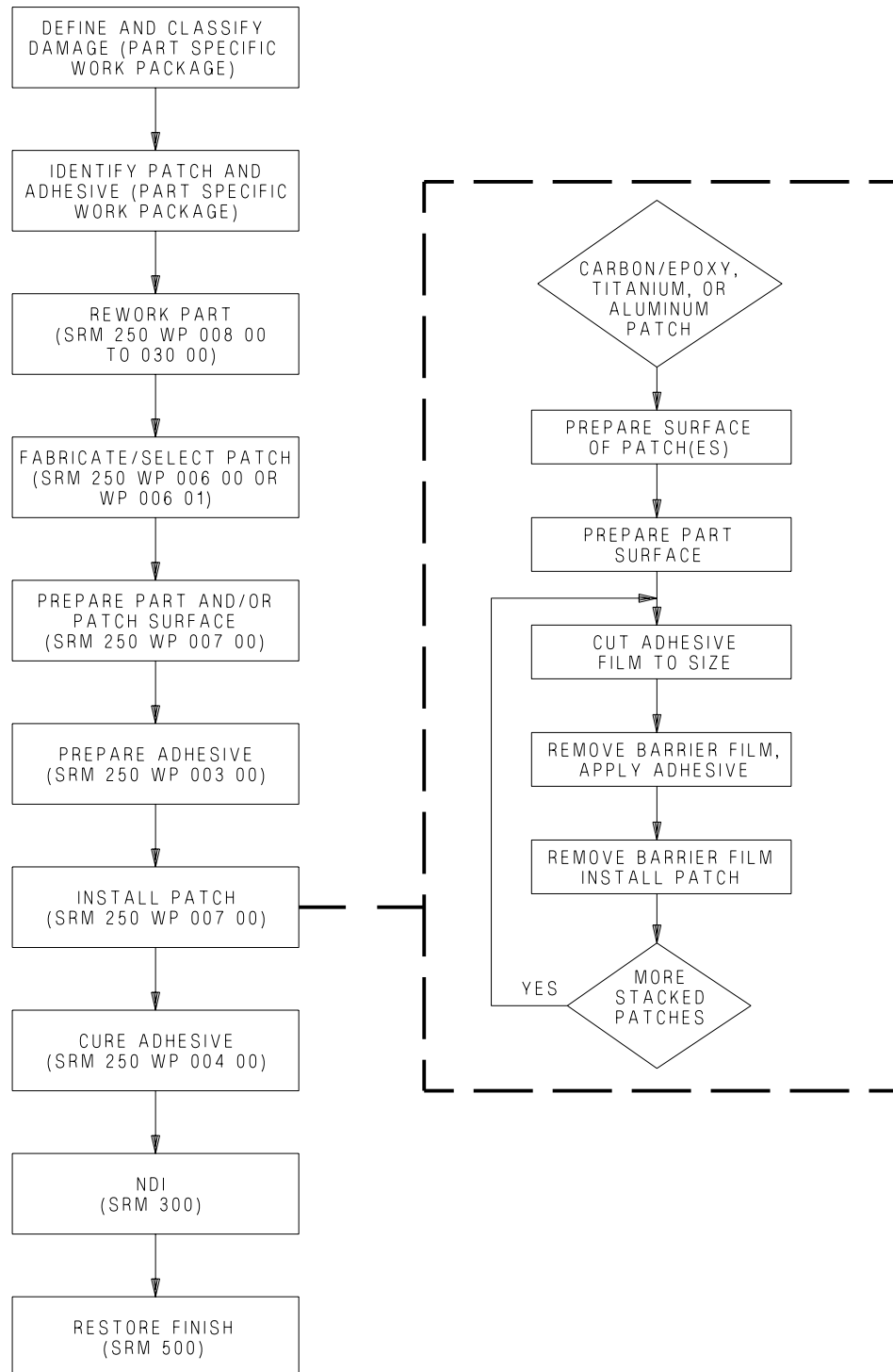


Figure 3. Preparation of Carbon/Epoxy Surfaces



**Figure 4. Patch Installation Film Adhesive**



EXPOSURE CONDITION	MAXIMUM EXPOSURE TIME
CONTROLLED ENVIRONMENT ROOM WITH AIR CONDITIONED FIL TERED AIR, HUMIDITY CONTROL	1 HOUR
CONTROLLED ENVIRONMENT ROOM, AIR CONDITIONED	30 MINUTES
HANGAR FLOOR/DECK	15 MINUTES
OPEN AIR/FLIGHTLINE	5 MINUTES

ADA790-92-1-039

**Figure 5. Maximum Exposure Time Allowed Between Surface Preparation Steps  
(Surfaces With Cured Primer May Be Excluded)**

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## ORGANIZATIONAL MAINTENANCE

### STRUCTURE REPAIR

#### TYPICAL REPAIR

## TITANIUM SURFACE PREPARATION FOR PATCH INSTALLATION

This WP supersedes WP007 01, dated 1 July 1998.

---

### Reference Material

None

### Alphabetical Index

None

### Record of Applicable Technical Directives

None

1. Procedures have been deleted. Titanium surface preparation for patch installation for metallic

structure repairs requires depot engineering disposition.



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN, CLASS I DAMAGE REPAIR

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Support Equipment Required

None

## Materials Required

Specification or Part Number	Nomenclature
EA9321 A/B	Adhesive
H-B-695 TYPE 1, GRADE A SIZE 1-1/2	Brush, Varnish,
CCC-C-440, TYPE 1, CLASS 1	Cheesecloth
200SG40TR, 2 Mil Thick	Plastic Sheet
A-A-1047, GRIT 180-9X11 240-9X11	Paper, Abrasive

**WARNING**

Sanding and cutting of graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

**CAUTION**

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

a. Remove surface finish and smooth out damage using 180 grit abrasive paper.

b. Clean area by wiping with clean dry cheesecloth.

c. Prepare adhesive (WP003 00).

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Brush fill damaged area to mold line with adhesive. Add excess adhesive to allow for shrinkage.

e. Cover adhesive with plastic sheet.

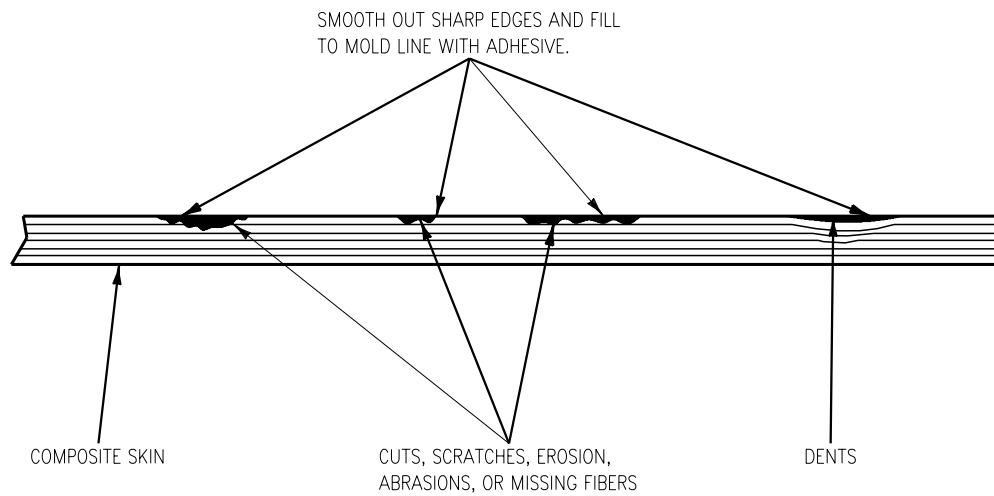
f. Cure adhesive (WP004 00).

g. Remove plastic sheet.

## CAUTION

Be careful not to sand into skin laminates causing damage.

h. Sand surface smooth using 240 grit abrasive paper.



**Figure 1. Class 1 Damage Repair**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN, CLASS II DAMAGE REPAIR

This WP supersedes WP009 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Nondestructive Inspection .....	A1-F18AC-SRM-300
Pulse Echo, Longitudinal Wave Contact, Without Delay Line, For Composite Laminate Material .....	WP008 02

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

## Support Equipment Required

## NOTE

Alternate item part numbers are shown indented.

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
—	Heat Lamp	EA956	Adhesive
—	Hot Air Gun	EA9396 A/B	Adhesive
—	C-Clamp	CCC-C-440	Cheesecloth
		TYPE 1	
		CLASS 1	
		A-A-1047 GRIT	Abrasive Paper
		240-9X11	
		855-1.000IN.	Pressure Sensitive Tape



**Materials Required (Continued)****NOTE**

Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

DS-108F	Solvent, Wipe
020X413	Cleaning Compound
GG-N-196	Hypodermic Syringe, No. 15
420	Sealant Gun Nozzle
—	Weights, for stacking (Amount as required to apply 5 pounds per square inch of repair area)
1/8-Inch Thick, size as Required to Cover Repair	Metal Backup Plates

- a. Solvent flush delamination per steps below:

**WARNING**

Solvent should be used with care. Gloves must be worn to prevent injury.

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

- (1) Fill hypodermic syringe with clean solvent or cleaning compound.

- (2) Insert needle into edge of delamination and thoroughly flush with solvent or cleaning compound.

- (3) Allow to air dry 15 minutes.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

**NOTE**

If tape will aid injection, tape edges of damaged area leaving small opening at each end.

- b. Prepare adhesive (WP003 00).
- c. To aid adhesive flow, preheat repair area to 100° to 110° F using heat lamp or hot air gun.
- d. Fill hypodermic syringe with adhesive.
- e. Insert needle into edge of delamination.
- f. Inject adhesive into delamination until it flows clear.
- g. Remove excess adhesive with clean dry cheesecloth.
- h. Tape over delamination, if required.
- i. Apply pressure to repair. Use metal backup plates with c-clamp or weights. Apply approximately 5 pounds pressure per square inch of repair area.
- j. Cure adhesive (WP004 00).
- k. Remove backup plates , c-clamp or weights, and tape if installed.

## WARNING

Sanding and cutting of graphite epoxy material produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

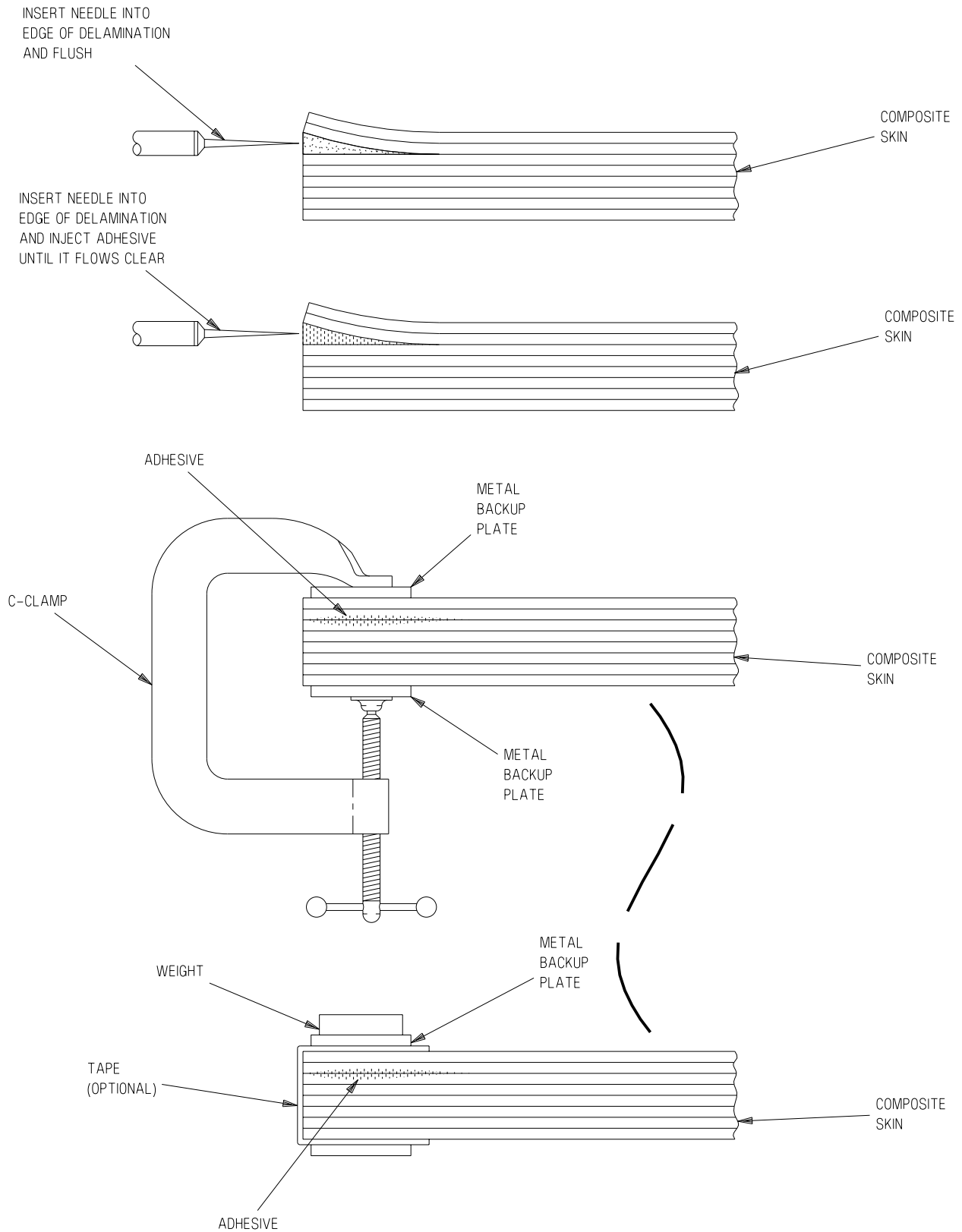
Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

## CAUTION

Be careful not to sand into part material, causing damage.

1. Sand area smooth using abrasive paper.

m. Do ultrasonic inspection of repair area to verify satisfactory injection and bonding of delamination (A1-F18AC-SRM-300, WP008 02).



**Figure 1. Class II Damage Repair**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN, CLASS III DAMAGE REPAIR

This WP supersedes WP010 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Graphite Epoxy Skin, Class II Damage Repair .....	WP009 00
Structure Repair, General Information .....	A1-F18AC-SRM-200
Drilling and Machining Composites .....	WP004 08
Aircraft Corrosion Control .....	A1-F18AC-SRM-500
Priming Procedures .....	WP011 00

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Loose Fibers Around Fastener Holes and/or Countersinks and Surface Ply Rips Repair .....	1
Missing Fibers and/or Skin Abrasions Repair .....	2

## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

**RIPS REPAIR.** See figure 1, details A and B.

2. This repair is applicable to loose or missing fibers, skin abrasions around fastener holes and/or countersinks, surface ply rips, and damaged fastener holes.

## Support Equipment Required

None

3. **LOOSE FIBERS AROUND FASTENER HOLES  
AND/OR COUNTERSINKS AND SURFACE PLY**

**Materials Required****NOTE**

Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

EA956	Adhesive
EA9396 A/B	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
H-B-695 TYPE1 GRADEA SIZE1	Brush, Varnish
A-A-1047 GRIT 320-9X11	Abrasive Paper
020X413	Cleaning Compound
MIL-A-41829	Utility Apron
ZZ-G-381, TYPE 1, STYLE 1	Chemical Gloves

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

**CAUTION**

Be careful not to break off loose fibers when cleaning damaged area.

a. Clean loose fibers by wiping with clean cheesecloth moistened with cleaning compound.

b. Allow to air dry 15 minutes.

c. If loose fibers cannot be lifted without being damaged to clean and brush apply adhesive, do Graphite Epoxy Skin, Class II Damage Repair (WP009 00), except no follow up NDI is required.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Prepare adhesive (WP003 00).

e. Carefully lift loose fibers and brush apply adhesive to all mating surfaces.

f. Position loose fibers and wipe off excess adhesive with clean dry cheesecloth.

g. Cure adhesive (WP004 00).

**WARNING**

Wear face protection, apron, and gloves when sanding graphite epoxy. Sanding produces fine dust that may cause skin irritation. Breathing excessive amount of dust may be harmful to health.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

**CAUTION**

Be careful not to sand into laminates, causing damage.

h. Lightly sand smooth using abrasive paper.

4. **MISSING FIBERS AND/OR SKIN ABRASIONS REPAIR.** See figure 1, detail A.

**Support Equipment Required**

None

**Materials Required****Specification  
or Part Number****Nomenclature**

EA9321 A/B	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
H-B-695 TYPE 1 GRADE A, SIZE 1-1/2	Varnish Brush
A-A-1047 GRIT 320-9X11	Abrasive Paper
020X413	Cleaning Compound
MIL-A-41829	Utility Apron
ZZ-G-381, TYPE 1, STYLE 1	Chemical Gloves

**WARNING**

Wear face protection, apron, and gloves when sanding graphite epoxy. Sanding produces fine dust that may cause skin irritation. Breathing excessive amount of dust may be harmful to health.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

**CAUTION**

Be careful not to sand into laminates, causing damage.

- a. Lightly sand damage area smooth using abrasive paper.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

- b. Clean damage area by wiping with clean cheesecloth moistened with cleaning compound.

- c. Allow to air dry 15 minutes.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- d. Prepare adhesive (WP003 00).

**NOTE**

Be careful when applying adhesive around fasteners not to get adhesive on fasteners.

- e. Fill damage with adhesive, flush with mold line.

- f. Cure adhesive (WP004 00).

**CAUTION**

Be careful not to sand into laminates; causing damage.

- g. Lightly sand area smooth using abrasive paper.

5. **DAMAGED FASTENER HOLES REPAIR.** See figure 1, detail C. Procedures below give two

methods for repairing holes using plug rivets and sleeves. Repair method one cleans holes up to 0.3350 inch diameter. Repair method two cleans holes up to 0.3995 inch diameter. Procedures for making repairs using either method and final hole sizes are determined by damage evaluation in applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials

### Materials Required

#### NOTE

■ Alternate item part numbers are shown indented.

Specification or Part Number	Nomenclature
MIL-A-41829	Utility Apron
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
MS20426B10-7	Rivet
MS20426B12-8	Rivet
ZZ-G-381, TYPE 1, STYLE 1	Chemical Gloves
MIL-S-83430, CLA-1/2	Sealing Compound
4M273C5-4	Sleeve
■ 4M273C4-4	Sleeve
■ 4M249C6-4	Sleeve
■ 020X413	Cleaning Compound

6. **Repair Method One.** This repair is applicable to fastener hole having a maximum diameter of 0.3350 inch.

a. Observe general information, safety precaution, and requirements relating to Drilling

and Machining Composites (A1-F18AC-SRM-200, WP004 08).

b. Drill fastener hole to 0.3330 +0.0020 -0.0000 inch diameter (A1-F18AC-SRM-200, WP004 08).

c. Countersink outer mold line hole 100 degrees to 0.490 +0.000 -0.010 inch diameter (A1-F18AC-SRM-200, WP004 08).

d. Countersink inner mold line hole 100 degrees to 0.403 +0.000 -0.010 inch diameter (A1-F18AC-SRM-200, WP004 08).

e. Insert flared end of 4M273C5-4 sleeve into outer mold line countersink. Nonflared end of sleeve shall be flush to 0.063 past inner mold line surface.

f. Observe general information and precautions relating to Priming Procedures (A1-F18AC-SRM-500, WP011 00).

g. Remove sleeve and apply two coats of primer to exterior of sleeve (A1-F18AC-SRM-500, WP011 00).

h. After primer has cured, install 4M273C5-4 sleeve per substeps below:

#### WARNING

Sealing compound is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

(1) Prepare sealing compound (WP003 00).

(2) Apply sealing compound to exterior of sleeve and insert into hole.

#### CAUTION

Make sure when flaring sleeve to apply limited pressure, avoiding damage to skin surface.

(3) Flare inner mold line end of sleeve applying squeeze pressure lightly. Flare shall be flush to 0.010 below mold line.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

(4) Wipe excess sealing compound from sleeve and surrounding surface with clean cheesecloth dampened with cleaning compound. Allow to air dry 15 minutes.

(5) Inspect sleeve. If cracks or splits exist, remove sleeve and repeat steps e through h.

(6) Cure sealing compound (WP004 00).

(7) After cure, inspect sleeve to make sure sleeve is tight and will not rotate when applicable fastener is installed. If sleeve rotates, replace sleeve.

i. Apply primer to MS20426B10-7 rivet (A1-F18AC-SRM-500, WP011 00).

j. Install rivet in sleeve using squeeze method.

k. Wipe excess primer from repair area using clean cheesecloth dampened with cleaning compound.

l. Trim rivet flush and smooth with inner and outer mold line surfaces.

m. Wipe repair with clean dry cheesecloth.

n. Drill and countersink fastener holes to original size per blueprint and applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.

**7. Repair Method Two.** This repair is applicable to fastener hole having a maximum diameter of 0.3995 inch.

a. Observe general information, safety precaution, and requirements relating to Drilling and Machining Composites (A1-F18AC-SRM-200, WP004 08).

b. Drill fastener hole to  $0.3975 +0.0020 -0.0000$  inch diameter.

c. Countersink outer mold line hole 100 degrees to  $0.540 +0.000 -0.005$  inch diameter (A1-F18AC-SRM-200, WP004 08).

d. Countersink inner mold line hole 100 degrees to  $0.468 +0.000 -0.010$  inch diameter (A1-F18AC-SRM-200, WP004 08).

e. Insert flared end of 4M249C6-4 sleeve into outer mold line countersink. Nonflared end of sleeve shall be flush to 0.063 past inner mold line surface.

f. Observe general information and precautions relating to Priming Procedures (A1-F18AC-SRM-500, WP011 00).

g. Remove sleeve and apply two coats of primer to exterior of sleeve (A1-F18AC-SRM-500, WP011 00).

h. After primer has cured, install 4M249C6-4 sleeve per substeps below:

**WARNING**

Sealing compound is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

(1) Prepare sealing compound (WP003 00).

(2) Apply sealing compound to exterior of sleeve and insert into hole.

**CAUTION**

Make sure when flaring sleeve to apply limited pressure, avoiding damage to skin surface.

(3) Flare inner mold line end of sleeve applying squeeze pressure lightly. Flare shall be flush to 0.010 below mold line.



## WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

(4) Wipe excess sealing compound from sleeve and surrounding surface with clean cheesecloth dampened with cleaning compound. Allow to air dry 15 minutes.

(5) Inspect sleeve. If cracks or splits exist, remove sleeve and repeat steps e through h.

(6) Cure sealing compound (WP004 00).

(7) After cure, inspect sleeve to make sure sleeve is tight and will not rotate when applicable fastener is installed. If sleeve rotates, replace sleeve.

i. Apply primer to MS20426B12-8 rivet. (A1-F18AC-SRM-500, WP011 00).

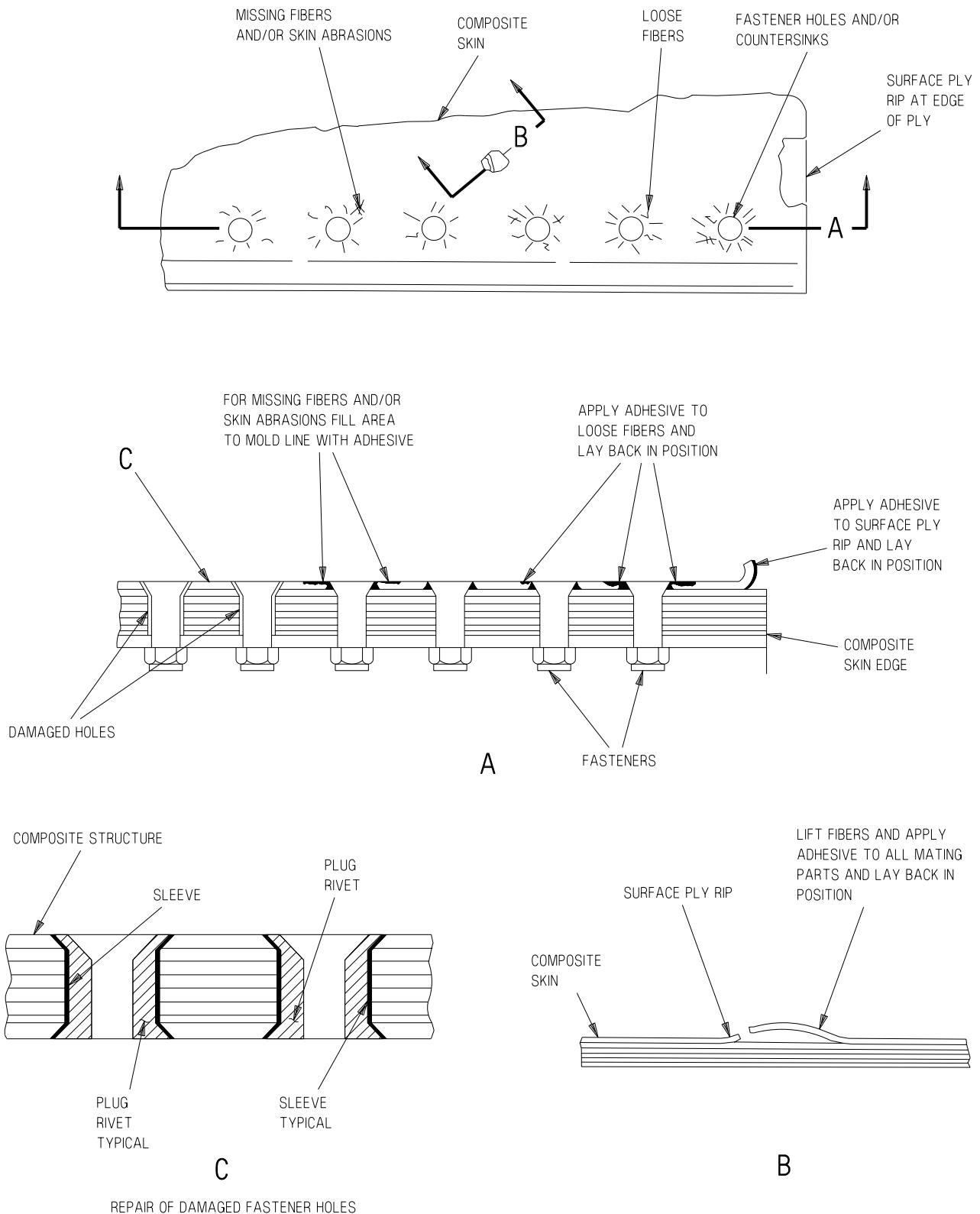
j. Install rivet in sleeve using squeeze method.

k. Wipe excess primer from repair area using clean cheesecloth dampened with cleaning compound.

l. Trim rivet flush and smooth with inner and outer mold line surfaces.

m. Wipe repair clean with clean dry cheesecloth.

n. Drill and countersink fastener holes to original size per blueprint and applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.



**Figure 1. Class III Damage Repair**



## INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN, CLASS IV DAMAGE REPAIR

This WP supersedes WP011 00, dated 1 January 1995.

## Reference Material

Structure Repair, General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application .....	WP011 00
Aline-A-Drill .....	WP004 13
Gang Channel and Plate Nut Identification and Repair .....	WP004 05
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

2. Bolt on patch repairs are made at intermediate maintenance.

## NOTE

Alternate item part numbers are shown indented.

## Support Equipment Required

Part Number or  
Type Designation

## Nomenclature

74D110172-1001

Tool Set-Structural  
Repair, Composite  
Materials

Torque Wrench  
0 - 100 Inch-Pounds

Specification  
or Part Number

MIL-S-83430,  
CLA-1/2  
74K000006  
EA9321 A/B  
ZZ-G-381, TYPE 1  
STYLE 1  
MIL-G-3866, TYPE 1

## Nomenclature

Sealing Compound  
Bolted Repair, Kit  
Adhesive  
Chemical Gloves  
Cotton Gloves

**Materials Required (Continued)****NOTE**

Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

A-A-1047 GRIT  
180-9X11  
240-9X11

Paper, Abrasive

PATTERN 30  
020X413  
855-1.000IN.

Cloth, Nylon  
Cleaning Compound  
Pressure Sensitive  
Tape

CCC-C-440 TYPE 1  
CLASS 1

Cheesecloth

SS-P-201 TYPE1  
CLASSB

Marking Pencil

ST3M430V4-( )  
HT271A4-( )

Fasteners

A4000RP3

Fasteners

AN960C416

Release Film

MIL-A-41829

Washer, Cres

NAS6304

Apron, Utility

Camie A1000

Fasteners

S00311

Release Agent

Release Agent

**WARNING**

Wear gloves, face shield, respirator, and apron when making repairs. Sanding and cutting of graphite epoxy skins produces a fine dust that may cause skin irritation. Breathing an excessive amount of dust may be injurious.

**CAUTION**

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

**NOTE**

Each 74K000006 repair kit contains an outer patch, two inner backing plates and a selection of four different thickness center plugs. Each item of repair kit is marked with an alignment arrow to make sure of correct assembly.

a. Select applicable diameter center plug to use as template.

b. Mark the smallest diameter circle which will completely cleanup damage using marking pencil.

c. Check hole edge or patch edge to fastener line clearances for affected part as defined in applicable structure repair manuals A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750.

**CAUTION**

Be sure that router does not damage inner surface of opposite skin or substructure. Use vacuum cleaner continuously when making repairs.

d. Remove damaged area using router motor with router bit. Vacuum dust and debris from damage.

e. Clean up damage to final hole diameter using 1 inch rotary file or equivalent. Vacuum clean repair area.

f. Check hole size to make sure backing plates can be inserted through hole.

g. Insert several layers of cheesecloth damp with clean water into hole to collect excess repair debris.



Be careful not to sand into base material causing damage.

h. Sand damage area under outer repair patch using 180 grit abrasive paper. Use vacuum cleaner to remove dust and chips.

i. Smooth surface until all paint is removed using 240 grit abrasive paper.

### WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

j. Wipe repair surface with clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes.

### NOTE

The center plugs alignment arrow must be pointing in same direction as outer patch's alignment arrow.

k. Attach applicable center plug to outer repair patch with two temporary fasteners and position patch over hole, detail C.

### NOTE

The patch's longitudinal axis is to be parallel to adjacent fastener pattern of existing part.

l. Mark each fastener hole with marking pencil. Mark edges of outer patch so that patch can be returned to same location.

m. Make an arrow on skin using marking pencil. Mark arrow same direction as arrow on top of outer patch so that patch can be located correctly.

### NOTE

If any fastener hole has less than 3/4-inch edge distance, repeat steps k through m, and relocate patch to get required edge distance. A depot engineering disposition is required if edge distance is not possible.

n. Remove patch and check fastener hole location. Maintain 3/4-inch minimum edge distance from edge of cleaned up hole.

o. Center drill guide over one of the fastener holes marked in step l nearest the damage hole. Clamp drill guide to skin using C-clamp.

p. Set up Aline-A-Drill with 0.234 inch diameter drill bit, coolant bushing and adapter (A1-F18AC-SRM-200, WP004 13).

### NOTE

Flush debris from hole by squirting water into coolant fitting during drilling operation as below.

q. Drill 0.234 inch diameter hole in graphite epoxy skin using Aline-A-Drill.

r. Remove drill guide and C-clamp. Reposition outer patch on skin. Make sure alignment arrows on skin and patch are aligned.

s. Install temporary fastener through patch and skin hole drilled in step q.

t. Insert 15/64-inch diameter step pin into hole of patch near fastener installed in step s.

u. Locate drill guide over step pin and secure using fastener installed in step s. Remove step pin.

v. Drill hole per step q. Install temporary fastener after each hole is drilled.

### NOTE

If fastener in previously drilled hole interferes with drilling process, fastener may be removed temporarily.

w. Repeat steps o through v until all fastener holes in patch are drilled in skin.

x. Remove patch from skin and thoroughly clean inner graphite epoxy surface with clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes.

y. Lightly sand inner skin surface in area of backing plates and around fastener holes using 180 grit abrasive paper. Wipe off dust with clean cheesecloth.

### WARNING

CAMIE A1000 release agent is a flammable liquid and vapor. May cause allergic skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Use only with adequate ventilation. Avoid breathing dust (vapor, mist, gas). Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

S00311 release agent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

z. Apply release film to backing plate surface that contains tack rivet countersink. Apply release agent on release film.

aa. Apply release agent to temporary fasteners and 1/4-inch washers.

ab. Cut out film over the four end holes and two center holes of each backing plate to aid in assembling of repair.

### WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

ac. Prepare adhesive (WP003 00).

ad. Apply adhesive to release film surface of backing plates. Position washers treated with release agent between temporary fasteners and outer skin surface.

### NOTE

Backing plates have unsymmetrical fastener patterns and to be correctly assembled, must have their alignment arrows pointing the same direction as arrow on outer patch.

ae. Insert two backing plates through repair hole cleaned up in steps d and e.

af. Attach fastener to center hole of each backing plate to aid in guiding plate into position.

ag. Locate backing plates on inner skin surface and clamp in place with temporary fasteners.

ah. Remove adhesive squeezed out from fastener holes and from backing plates using clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes.

ai. Allow adhesive to set at room temperature for 2 hours before removing temporary fasteners.

### NOTE

Make sure gap of 0.010 to 0.050 inch exists between outer surface of skin and top of plug to allow for shimming of plug with adhesive.

aj. Cure adhesive (WP004 00).

ak. Select required combination of center plugs to fill cavity between backing plates and outer patch.

al. Remove temporary fasteners securing backing plate. Position center plugs in place with alignment arrows pointing in correct direction.

am. Position outer patch over plug and backing plates and secure with temporary fasteners.

an. Make sure alignment arrow is pointing in same direction as the one on skin.

ao. Clean up cured adhesive from fastener holes by drilling with 0.234-inch diameter drill. Drill completely through backing plate.

ap. Remove temporary fastener before drilling each hole and replace after hole is drilled.

### NOTE

When reaming holes per steps below, limit reaming holes to one time. Make sure pilot of carbide reamer engages backing plate hole before reaming operation.

aq. Remove temporary fastener and drill 0.250 +0.003 -0.000 inch diameter hole using drill motor with a piloted reamer.

ar. Insert temporary fastener after hole is reamed to final size.

as. Repeat steps aq and ar until all holes have been reamed to final size.

at. Remove temporary fasteners, patch, center plugs, and backing plates. Deburr patch, plugs, backing plates and mating structure.

au. Remove cheesecloth from repair cavity, installed in step g.

av. Remove all foreign materials from repair cavity using vacuum cleaner.

### NOTE

If hole tolerance of 0.250 +0.003 -0.000 (step aq) has been exceeded, a depot engineering disposition is required.

aw. Check hole tolerance in patch, backing plates, and skin.

### NOTE

Nominal edge distance is 3/4-inch. Edge distance less than 0.6 inch requires a depot engineering disposition.

ax. Measure edge distance of fastener holes to edge of cleanup hole. ■

ay. Clean the patch, center plug, and backing plates with clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes. ■

az. Attach plate nuts to backing plates.

### NOTE

Tape over center plug, and backing plate holes to prevent release agent from getting on backing plate face sealing surface. ■

ba. Apply release agent on plate nuts that mate with center plug and fasteners. ■

### NOTE

Make sure alignment arrows on skin and backing plates are pointing in same direction.

bb. Install backing plates through hole in skin. Install threaded assembly pins in four end holes of backing plates to aid in holding plates during assembly. Pull backing plates into position using assembly pins.

bc. Install NAS6304 fasteners with AN960C washers under fastener heads to hold backing plates in position and to remove threaded assembly pins.

bd. Apply tape over gap between backing plates in damage cleanup hole.



be. Coat threaded assembly pins with release agent and insert assembly pins in center plug and backing plate holes.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

bf. Prepare adhesive (WP003 00).

bg. Install center plug with location arrow in correct orientation. Fill all gaps between center plug and skin and center plug and backing plates with adhesive.

bh. Fair center plug flush with outer surface of skin using fairing tool.

bi. Allow adhesive to set at room temperature for 2 hours. Verify adhesive is setup to a tacky condition.

bj. Cure adhesive (WP004 00).

bk. Remove threaded assembly pins and NAS 6304 fasteners with AN960C washers.

bl. Sand cured adhesive flush with outer surface of skin using 180 grit abrasive paper. Smooth surface using 240 grit abrasive paper.

bm. Wipe repair surface with clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes.

bn. Temporarily install outer patch on graphite epoxy skin with alignment arrow pointing same

direction as arrow on skin. Insert assembly pins in end holes of patch to aid in holding patch.

bo. Check fastener holes to determine fastener grip length using grip length gage (A1-F18AC-SRM-200, WP004 05).

## NOTE

After grip length is established, record grip length next to fastener holes.

## WARNING

Sealing compound is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

bp. Prepare sealing compound (WP003 00).

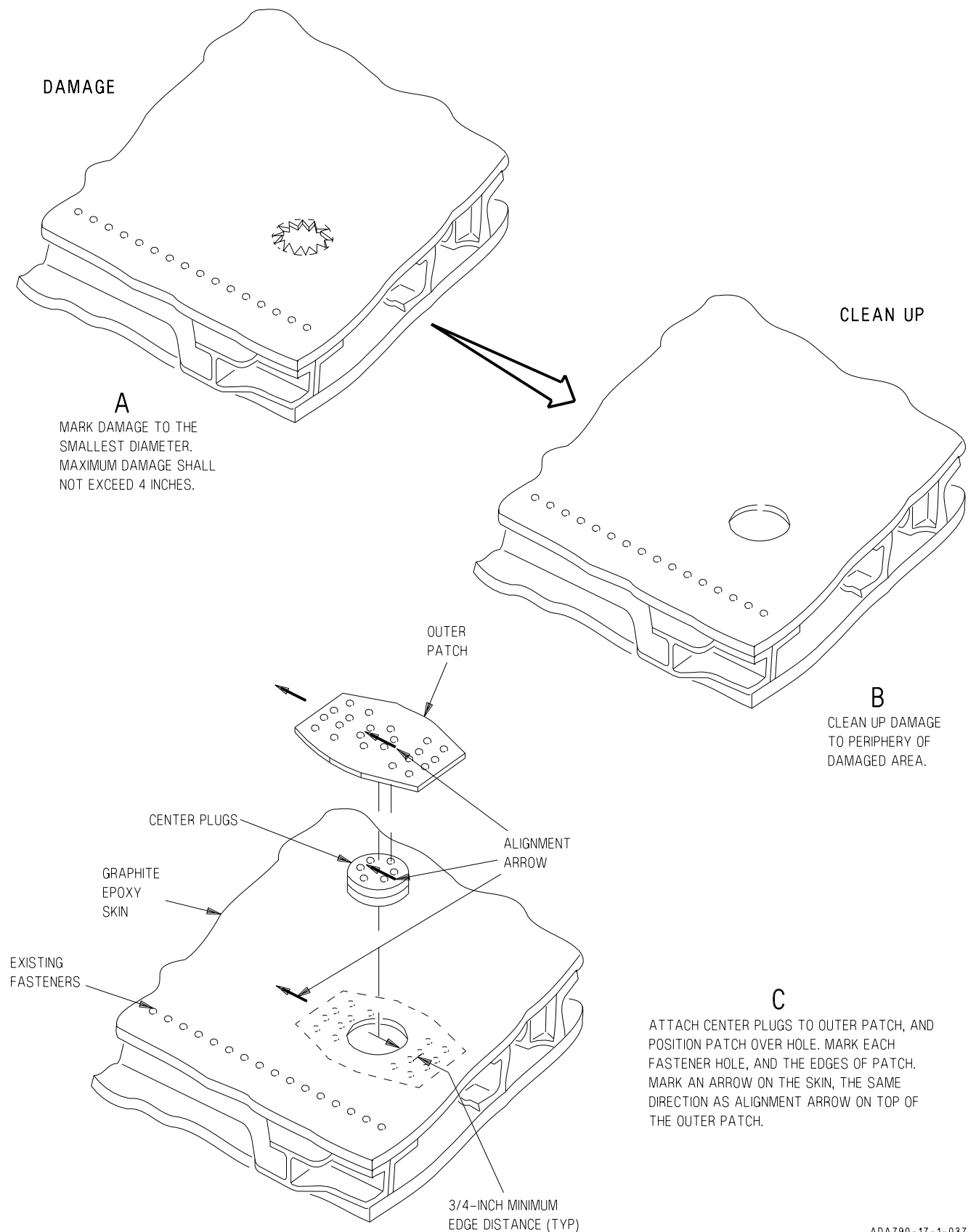
bq. Remove assembly pins and outer patch. Fay seal mating surfaces of patch and skin with sealing compound. Install outer patch with alignment arrow pointing same direction as arrow on skin.

br. Install ST3M430V4-( ), (HT271A4-( ) fasteners wet with sealing compound (A1-F18AC-SRM-200, WP011 00).

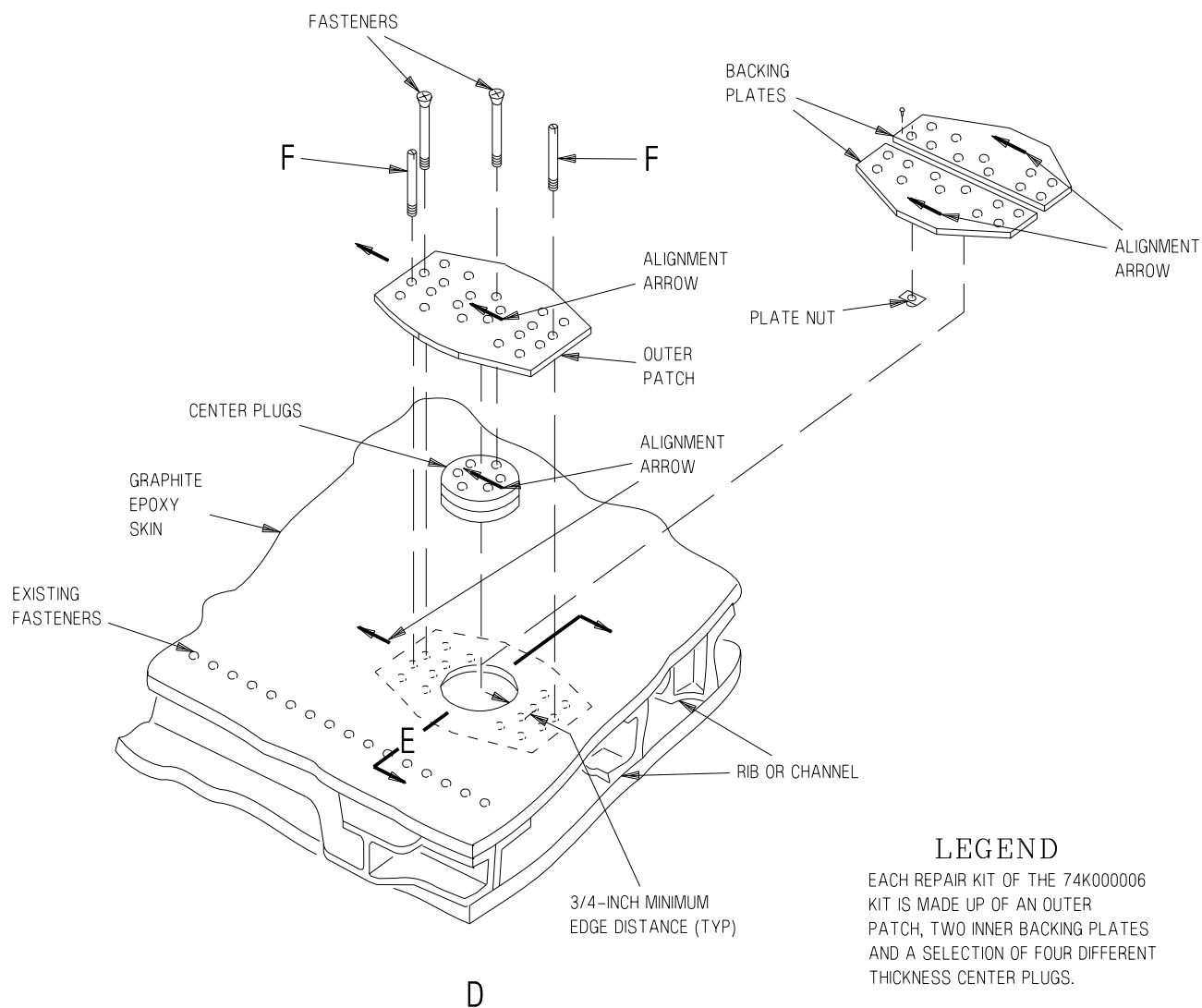
bs. Start fastener threads in plate nuts by hand. Tighten fasteners to 50 to 70 in-lbs using torque wrench and diagonally opposite pattern.

bt. Remove excess sealing compound with clean cheesecloth and fair sealing compound with mold line. Check bolts and tighten 50 to 70 in-lbs, if required, per step bs.

bu. Cure sealing compound (WP004 00).

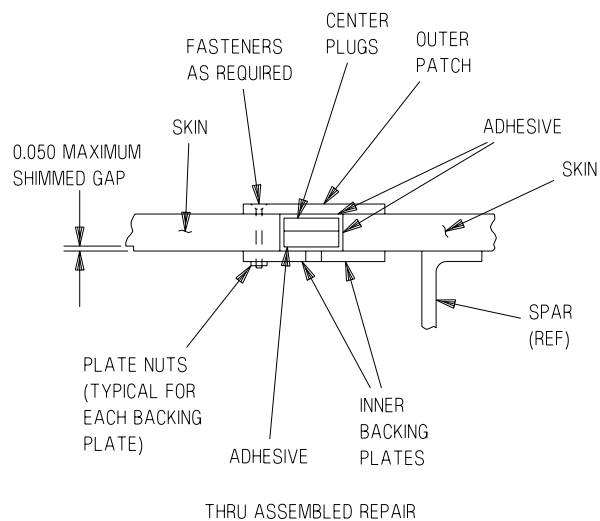
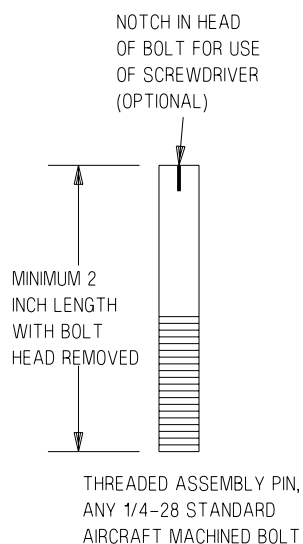


**Figure 1. Class IV Damage Repair (Sheet 1)**



## LEGEND

EACH REPAIR KIT OF THE 74K000006 KIT IS MADE UP OF AN OUTER PATCH, TWO INNER BACKING PLATES AND A SELECTION OF FOUR DIFFERENT THICKNESS CENTER PLUGS.



F

E

**Figure 1. Class IV Damage Repair (Sheet 2)**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN, CLASS V DAMAGE REPAIR

This WP supersedes WP011 01, dated 1 August 1997.

## Reference Material

Aircraft Corrosion Control.....	A1-F18AC-SRM-500
Finish System.....	WP012 00
Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honey- comb Core.....	WP008 01
Structure Repair, Typical Repair.....	A1-F18AC-SRM-250
Material Preparation.....	WP003 00
Curing of Repairs.....	WP004 00

## Alphabetical Index

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Positive Pressure Injection .....	1
Vacuum Impregnation Injection .....	3

## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

2. There are two methods of repair for delaminations not open to edge: positive pressure injection and vacuum impregnation injection. Procedures for both methods are given below.

3. **POSITIVE PRESSURE INJECTION.** This is the preferred method if positive air flow through laminate is possible.

## Support Equipment Required

## NOTE

Alternate type designations or part numbers are listed in parentheses.

Part Number or  
Type Designation

Nomenclature

## Support Equipment Required

## NOTE

Alternate type designations or part numbers are listed in parentheses.  
(Continued)

Part Number or  
Type Designation

## Nomenclature

74D110172-1001	Tool Set - Structural Repair, Composite Materials
74D110165-1001 (1935AS100-1)	Repair Set, Temperature/ Vacuum Control, Composite Structure
538A	Air Regulator Assembly, with Oil- Water Separator and Gage
—	Infrared Heat Source, 250 Watt
MS3101R16-10P	Connector

## Materials Required

## NOTE

Alternate item part numbers are shown  
indented.

Specification  
or Part Number

## Nomenclature

EA956	Adhesive
EA9396 A/B	Adhesive
MIL-G-3866, TYPE 1	Gloves, Cotton
CCC-C-440 TYPE 1	Cheesecloth
CLASS 1	
A-A-1047 GRIT	Paper, Abrasive
240-9X11	
855-1-000 IN.	Pressure Sensitive Tape
—	1/2-Inch Surgical Rubber or Plastic Tubing
250-CP2-1/2	Sealing Gun Cartridges
420	Sealing Gun Nozzles

## WARNING

Drilling graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

## CAUTION

Wear clean cotton gloves when making repairs to prevent contamination.

a. Drill 1/8-inch diameter hole at each end of delamination. Minimum spacing between holes is 1/2-inch.

b. Remove burrs or chips from holes.

c. Make sure holes are located within delamination per substeps below:

(1) Fit sealing nozzles into holes at each end of delamination. Tape over intermediate holes with pressure sensitive tape.

(2) Attach a piece of tubing to one nozzle and submerge other end in container of water.

(3) Attach other nozzle to sealant gun cartridge without plunger and place cartridge in sealant gun. Attach regulated source of compressed air to sealant gun.

(4) Apply pressure with air regulator set for 40 psi through sealant gun into delamination.

(5) Check water for bubbles to make sure air flow exists. If air flow exists, go to step d. If air flow does not exist, do substeps c(6) and c(7).

(6) Do NDI to locate delamination (A1-F18AC-SRM-300, WP008 01).

(7) Repeat steps a and c(1) through c(5).

**NOTE**

If air flow is still not possible after second try, do vacuum impregnation method, per paragraph 4.

d. Remove nozzle from holes.

e. Connect infrared heat source to 74D110165 repair set with connector. Preheat area to be repaired 120° to 130°F to aid adhesive flow.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

f. Prepare adhesive (WP003 00). Fill delamination with adhesive per substeps below:

(1) Attach regulated source of compressed air to sealant gun. Set air regulator for 40 psi and inject adhesive into one hole and fill until adhesive flows clear from other hole(s).

(2) Wipe off excess adhesive with clean dry cheesecloth.

g. Cure repair (WP004 00).

**WARNING**

Sanding graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

**CAUTION**

Be careful not to sand into skin laminates, causing damage.

h. Lightly sand repair area smooth using abrasive paper, wipe with clean dry cheesecloth.

i. Do NDI to make sure delamination is completely filled (A1-F18AC-SRM-300, WP008 01). If not filled, reclassify the damage. Refer to applicable structure repair manual.

j. Apply finish system to repair area (A1-F18AC-SRM-500, WP012 00).

**4. VACUUM IMPREGNATION INJECTION.** This method is used when the delamination is very fine and little or no air flow is possible.

**Support Equipment Required****NOTE**

Alternate type designations or part numbers are listed in parentheses.

**Part Number or  
Type Designation****Nomenclature**

74D110172-1001

Tool Set -  
Structural Repair,  
Composite Materials

## Support Equipment Required

## NOTE

Alternate type designations or part numbers are listed in parentheses.  
(Continued)

Part Number or  
Type Designation

## Nomenclature

74D110165-1001 (1935AS100-1)	Repair Set, Temperature/ Vacuum Control, Composite Structure Infrared Heat Source, 250 Watt
—	Vacuum Gage, 0 to 30 Inch-Pounds
AN924-4	Nut
—	Lexan Plate with Vacuum Chamber or Equivalent
AN833-4D	Elbow
AN832-4	Union
MS3101R16-10P	Connector

## Materials Required

## NOTE

Alternate item part numbers are shown indented.

Specification  
or Part Number

## Nomenclature

EA956	Adhesive
EA9396 A/B	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
A-A-1047 GRIT 240-9X11	Paper, Abrasive
9151-0-500	Tape, Adhesive
Camie A1000	Release Agent
S00311	Release Agent
MIL-G-3866, TYPE 1	Gloves, Cotton
MIL-A-41829	Apron, Utility

## WARNING

Drilling graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

## CAUTION

Wear clean cotton gloves when making repairs to prevent contamination.

a. Drill 1/8-inch diameter hole at each end of delamination. Minimum spacing between holes is 1/2-inch.

b. Remove burrs and chips from holes.

c. Do NDI to make sure holes are located within the delamination (A1-F18AC-SRM-300, WP008 01).

d. Assemble elbow, nut, and union to vacuum chamber or equivalent, and install vacuum gage to Lexan plate or equivalent.

## WARNING

CAMIE A1000 release agent is a flammable liquid and vapor. May cause allergic skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Use only with adequate ventilation. Avoid breathing dust (vapor, mist, gas). Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

S00311 release agent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

- e. Coat vacuum chamber or equivalent with release agent. Allow to air dry 20 minutes.
- f. Preheat area to be repaired using infrared heat source 120° to 130° F to aid adhesive flow. Connect infrared heat source to 74D110165 repair set with connector.
- g. Build a dam of adhesive tape around area to be repaired.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- h. Prepare adhesive (WP003 00).
- i. Pour adhesive into area.

## NOTE

Pour in excess adhesive, but do not fill dam area. Leave room for adhesive to bubble so that adhesive does not clog vacuum line.

- j. Cover with Lexan plate and vacuum chamber or equivalent, and seal with adhesive tape.
- k. Connect 74D110165-1001 or 1935AS100-1 repair set to elbow on vacuum chamber or equivalent.
- l. Set power switch on vacuum control assembly to ON.
- m. Pull vacuum of 20 to 29 inches of mercury on adhesive and hold vacuum until no more air bubbles escape or until 5 to 7 minutes pass.
- n. After air bubbles are removed, turn off vacuum and vent adhesive to atmosphere for 10 minutes.
- o. Turn power switch on vacuum control assembly to ON. Apply vacuum for an additional 3 to 5 minutes.
- p. Turn off vacuum. Vent adhesive and disconnect.
- q. Remove Lexan plate with vacuum chamber or equivalent, adhesive tape. Wipe off excess adhesive with clean dry cheesecloth.
- r. Cure repair (WP004 00).

## WARNING

Sanding graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

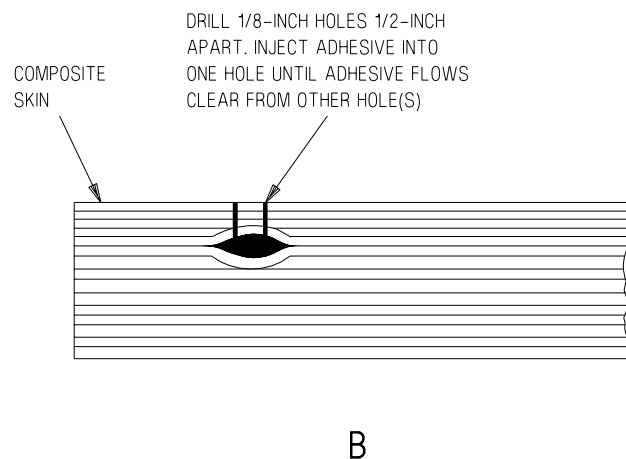
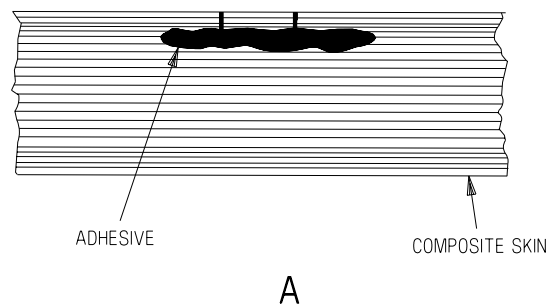
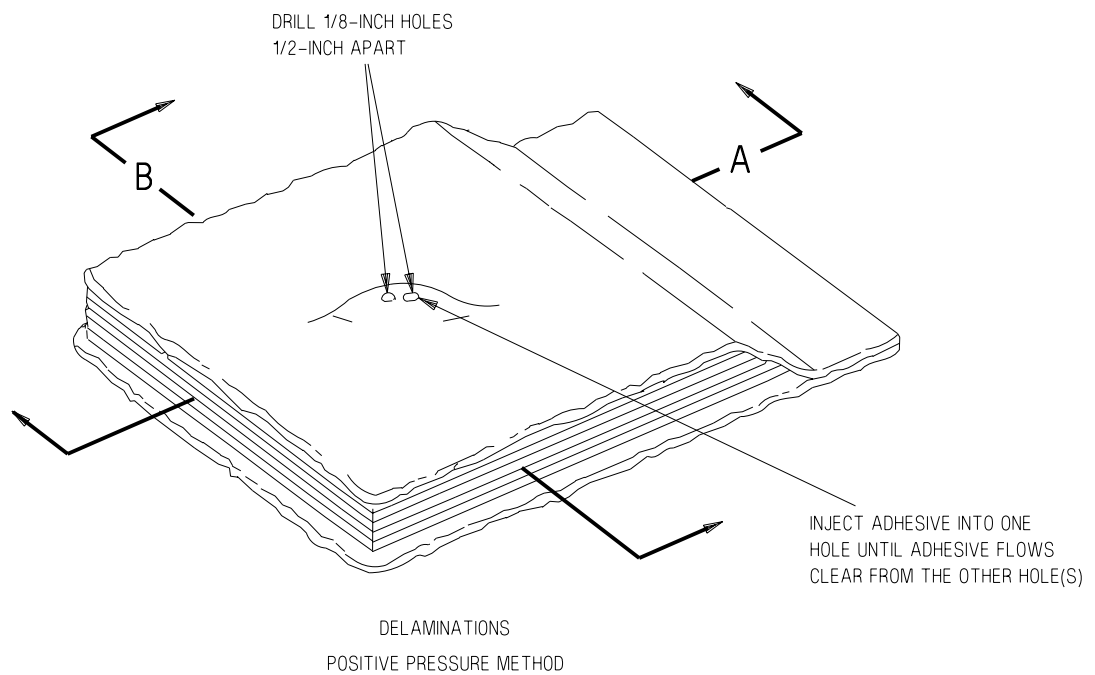
Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

- s. Lightly sand repair area smooth using abrasive paper.

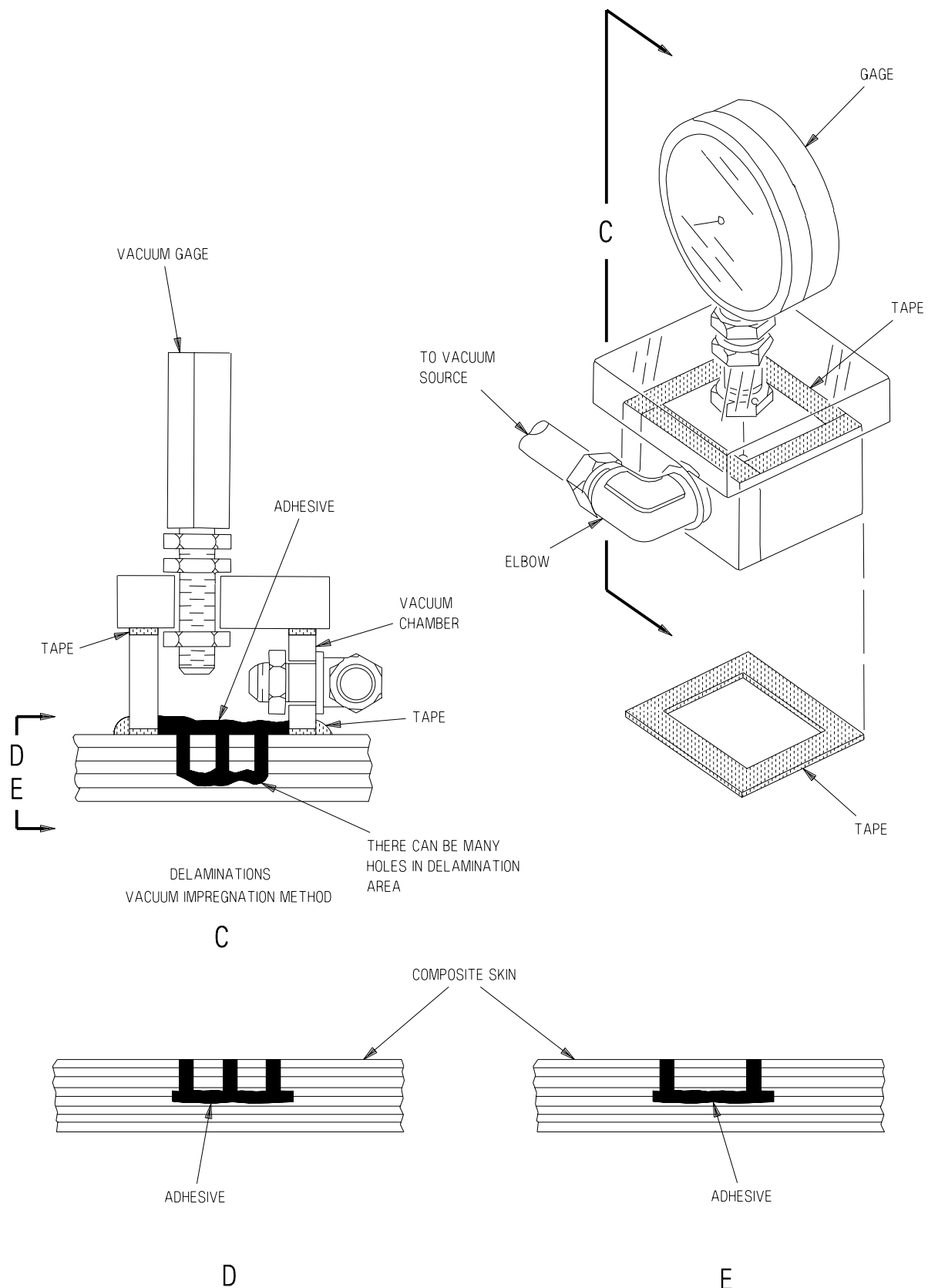


t. Do NDI to make sure delamination is filled (A1-F18AC-SRM-300, WP008 01). If not filled, reclassify the damage. Refer to applicable structure repair manual.

u. Apply finish system to repair area (A1-F18AC-SRM-500, WP012 00).



**Figure 1. Class V Damage Repair (Sheet 1)**



**Figure 1. Class V Damage Repair (Sheet 2)**

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ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE,  
CLASS I DAMAGE REPAIR

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## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

## Support Equipment Required

None

Specification  
or Part Number

## Nomenclature

EA9321 A/B	Adhesive
CCC-C-440, TYPE 1, CLASS 1	Cheesecloth, Cloth
H-B-695 CLASS I or CLASS II	1/2 to 1-Inch Wide Varnish Brush
200SG40TR	Plastic Sheet
A-A-1047, GRIT 180-9X11, 240-9X11	Paper, Abrasive

## WARNING

Sanding and cutting of graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

## CAUTION

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

Be careful when removing surface finish not to damage base material of skin.

a. Remove surface finish and lightly smooth damaged area using 180 grit abrasive paper.

b. Clean area by wiping with clean dry cheesecloth.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

c. Prepare adhesive (WP003 00).

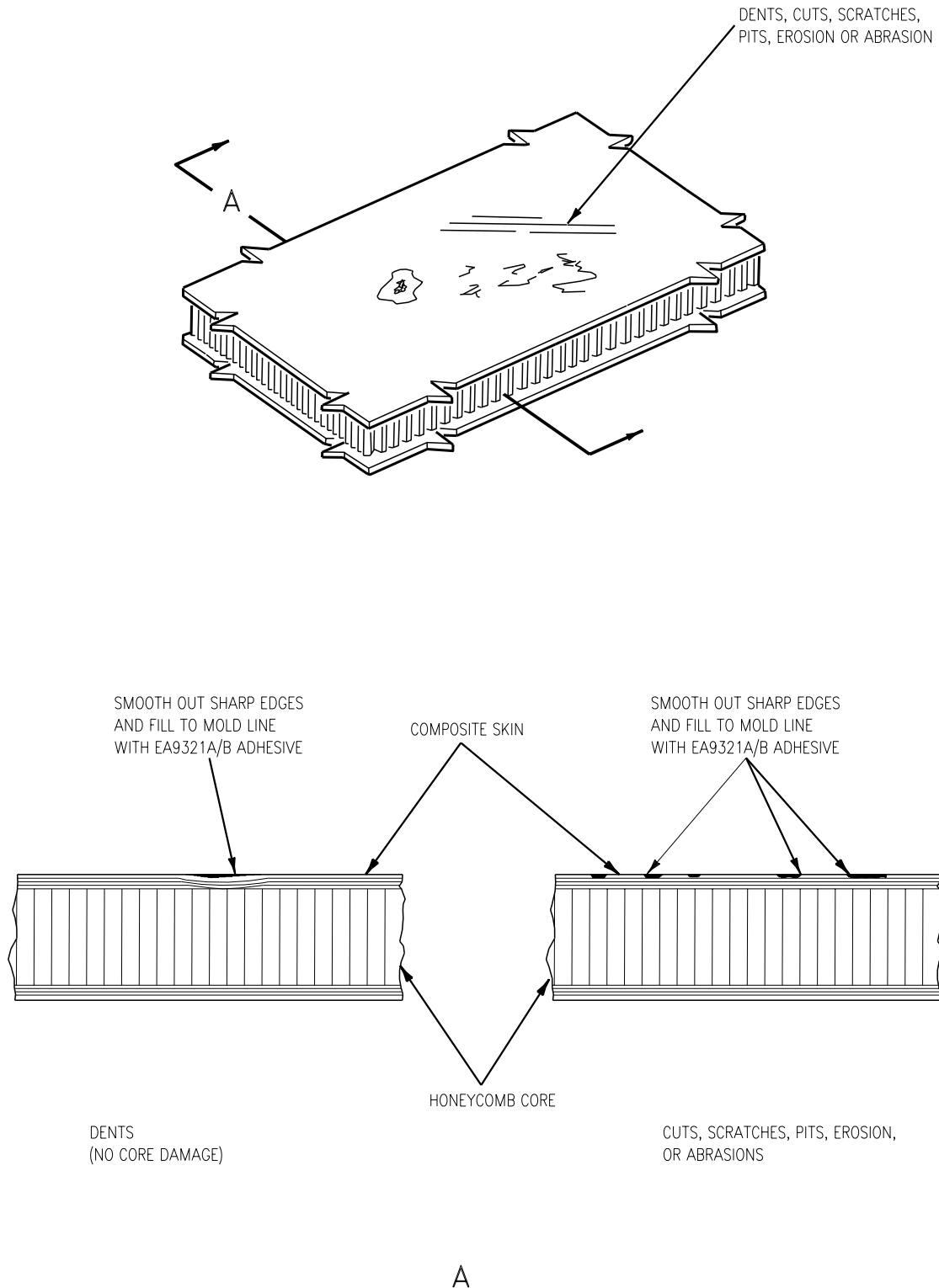
d. Fill damaged area to mold line with adhesive. Add excess adhesive to allow for shrinkage.

e. Cover adhesive with plastic sheet.

f. Cure adhesive (WP004 00).

g. Remove plastic sheet.

h. Sand surface smooth using 240 grit abrasive paper.



**Figure 1. Class I Damage Repair**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS II DAMAGE REPAIR

## Reference Material

Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honey- comb Core .....	WP008 01
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

2. This procedure is applicable to metallic and nonmetallic channels, ribs, or spars.

## Materials Required

## NOTE

Alternate item specification or part numbers are shown indented.

## Support Equipment Required

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
		EA956 A/B	Adhesive
		EA9396 A/B	Adhesive
		CCC-C-440, TYPE 1, CLASS 1	Cheesecloth
74D110172-1001	Tool Set - Structural Repair, Composite Materials	855-1-000 IN. 450	Pressure Sensitive Tape Sealant Gun Nozzle
538A	Air Regulator Assembly, with Oil- Water Separator and Gage	A-A-1047, GRIT 240-9X11 —	Paper, Abrasive  1/2-Inch Surgical Rubber or Plastic Tubing



**Materials Required (Continued)****NOTE**

Alternate item specification or part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

250-CP2-1/2

Sealing Gun Cartridges

**WARNING**

Sanding or drilling of a graphite epoxy part produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

a. Drill 1/8-inch diameter hole at each end of unbond or void area. Minimum spacing between holes is 1/2-inch.

b. Remove burrs and chips.

c. Make sure holes are located within unbond or void area per substeps below:

(1) Fit sealing nozzles into holes at each end of void or unbond. Tape over intermediate holes with pressure sensitive tape.

(2) Attach a piece of tubing to one nozzle and submerge other end in container of water.

(3) Attach other nozzle to sealant gun cartridge without plunger and place cartridge in sealant gun. Attach a regulated source of compressed air to sealant gun.

(4) Apply pressure with air regulator set for 40 psi through sealant gun into void or unbond.

(5) Check water for bubbles to make sure air flow exists. If air flow exists, go to step d. If air flow does not exist, repeat steps a and c(1) through c(5).

d. Remove nozzle from holes.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact of skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

e. Prepare adhesive (WP003 00).

f. Fill unbond or void area with adhesive per substeps below:

(1) Attach a regulated source of compressed air to sealant gun. Set air regulator for 40 psi and inject adhesive into one hole and fill until adhesive flows clear from other hole.

(2) Wipe off excess adhesive with clean dry cheesecloth.

(3) Cover holes with tape.

(4) Fill any unused holes with adhesive.

g. Cure adhesive (WP004 00).

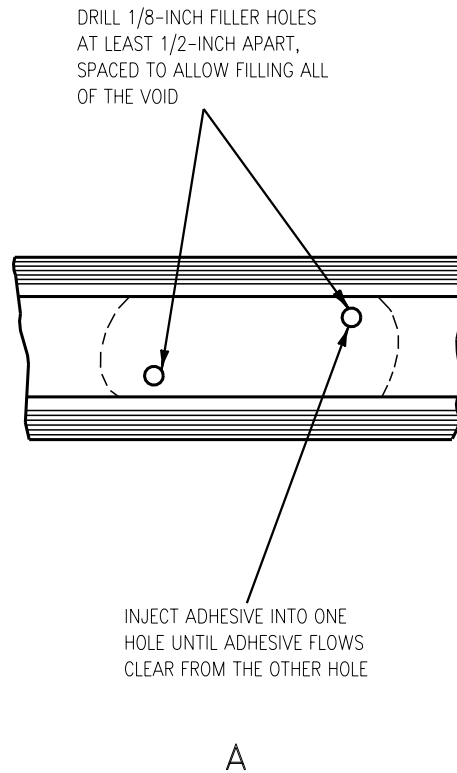
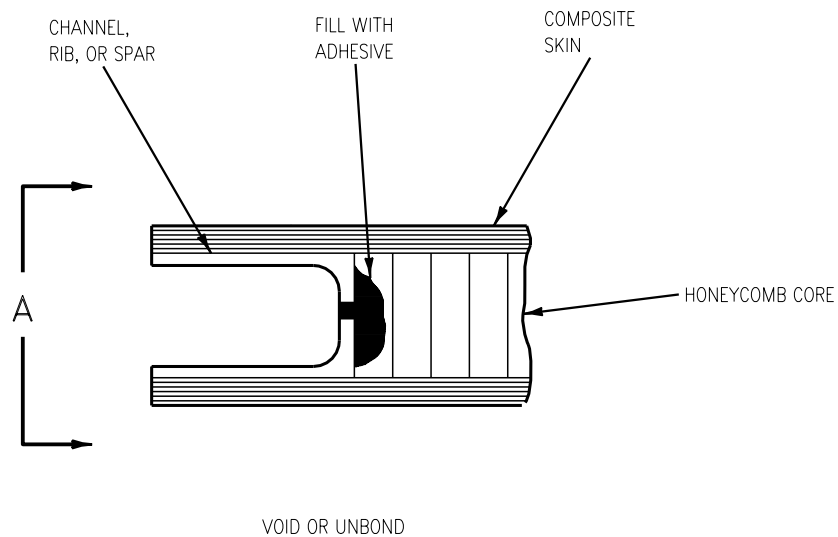
h. Remove tape.

**CAUTION**

Be careful not to sand into part material causing damage.

i. Sand area smooth using abrasive paper.

j. Do NDI to make sure unbond or void area is completely filled (A1-F18AC-SRM-300, WP008 01). If not filled, reclassify the damage. Refer to applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.



**Figure 1. Class II Damage Repair**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS III DAMAGE REPAIR

## Reference Material

Aircraft Corrosion Control.....	A1-F18AC-SRM-500
Primer Procedures .....	WP011 00
Finish System .....	WP012 00
Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honey- comb Core .....	WP008 01
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Aluminum, Graphite Epoxy, or Titanium Patch Installation and Removal....	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

Support Equipment Required  
(Continued)

Support Equipment Required			
Part Number or Type Designation	Nomenclature	Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials	538A	Air Regulator Assembly, with Oil- Water Separator and Gage

**Materials Required****NOTE**

Alternate item specification or part numbers are shown indented.

<b>Specification or Part Number</b>	<b>Nomenclature</b>
EA956 A/B	Adhesive
EA9396 A/B	Adhesive
CCC-C-440, TYPE 1, CLASS 1	Cheesecloth
A-A-1047, GRIT 240-9X11	Paper, Abrasive
855-1-000 IN. 420	Pressure Sensitive Tape
—	Sealant Gun Nozzle
	1/2-Inch Surgical Rubber or Plastic Tubing
250-CP2-1/2	Sealing Gun Cartridge

**WARNING**

Sanding or drilling of graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

a. Drill 1/8-inch diameter hole at each end of unbond or delamination. Minimum spacing between holes is 1/2-inch.

b. Remove burrs or chips from holes using vacuum cleaner.

c. Make sure holes are located within unbond or delamination per substeps below:

(1) Fit sealing nozzles into holes at each end of delamination or unbond. Tape over intermediate holes with pressure sensitive tape.

(2) Attach a piece of tubing to one nozzle and submerge other end in container of water.

(3) Attach other nozzle to sealant gun cartridge without plunger and place cartridge in sealant gun. Attach a regulated source of compressed air to sealant gun.

**NOTE**

Air pressure must not exceed 20 psi if unbonds or delaminations exist in area of honeycomb core. Air pressure of 40 psi may be applied if unbonds or delaminations, existing between mating skins or between skin plies, are not in area of honeycomb core.

(4) Apply pressure with air regulator set for 20 psi through sealant gun into delamination or unbond.

(5) Check water for bubbles to make sure air flow exists. If air flow exists, go to step d. If air flow does not exist, do substeps c(6) and c(7).

(6) Do NDI to locate unbond or delamination (A1-F18AC-SRM-300, WP008 01).

(7) Repeat step a and substeps c(1) through c(5).

d. Remove nozzle from holes.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

e. Prepare adhesive (WP003 00).

f. Fill unbond or delamination with adhesive per substeps below:

## NOTE

Air pressure must not exceed 20 psi if unbonds or delaminations exist in area of honeycomb core. Air pressure of 40 psi may be applied if unbonds or delaminations, existing between mating skins or between skin plies, are not in area of honeycomb core.

(1) Attach a regulated source of compressed air to sealant gun. Set air regulator for 20 psi and inject adhesive into one hole and fill until adhesive flows clear from other hole.

(2) Wipe off excess adhesive with clean dry cheesecloth.

g. Cover adhesive with tape and cure repair (WP004 00).



Be careful not to sand into skin laminates causing damage.

h. After cure, remove tape and sand repair surface smooth using abrasive paper.

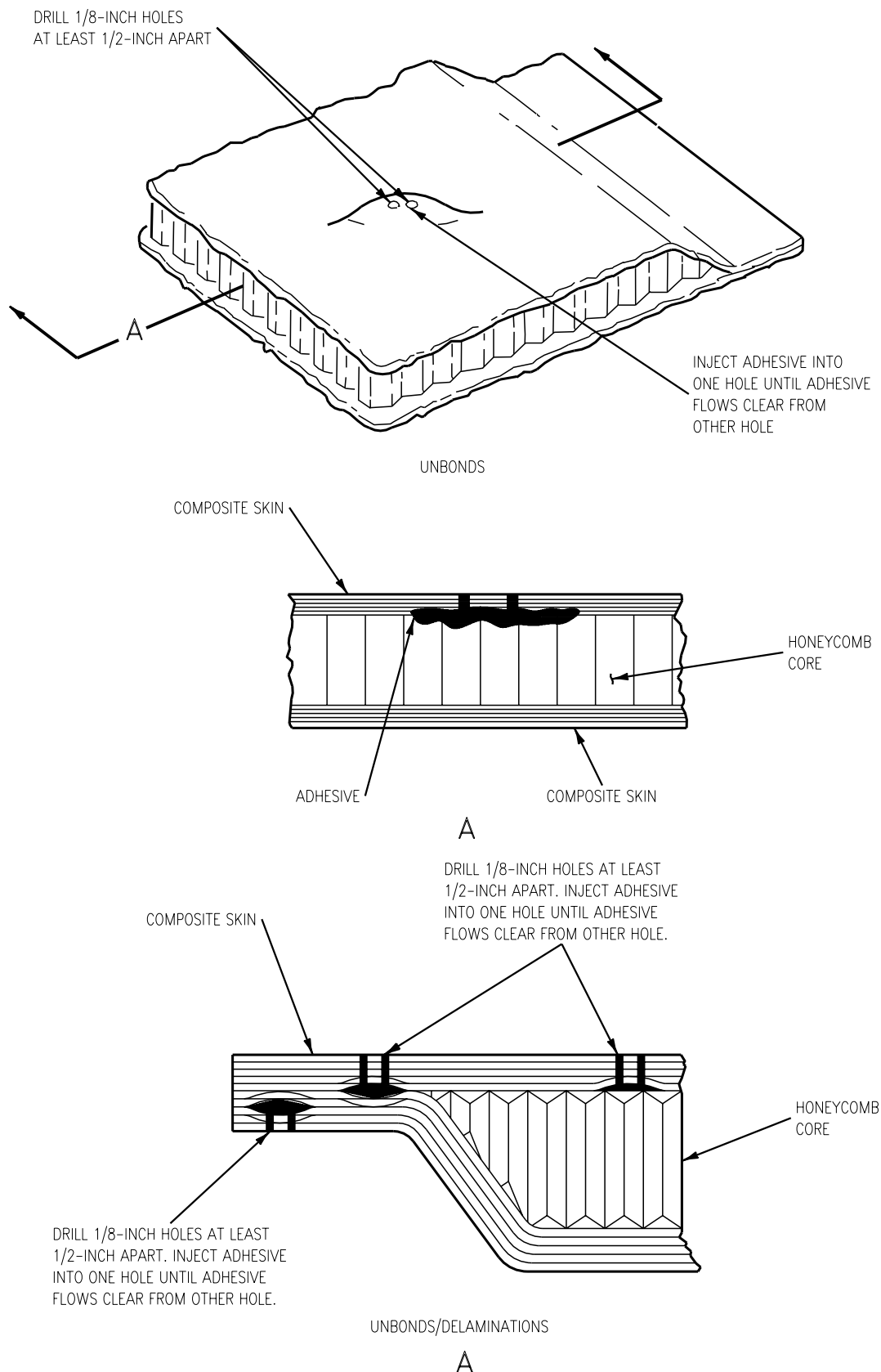
i. Do NDI to make sure unbond or delamination is filled (A1-F18AC-SRM-300, WP008 01). If unbond or delamination is filled, go to step j. If not filled, reclassify the damage. Refer to applicable structure repair manual.

## NOTE

If the applicable structure repair manual does not require patches, refinish injection holes (A1-F18AC-SRM-500 WP011 00 and WP012 00).

j. If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structural repair manual, install applicable patches (WP007 00).

k. If patch has been installed, do NDI to verify bond line integrity (A1-F18AC-SRM-300, WP008 01).



**Figure 1. Class III Damage Repair**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS IV DAMAGE REPAIR

This WP supersedes WP015 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Nondestructive Inspection .....	A1-F18AC-SRM-300
Pulse Echo, Longitudinal Wave Contact, Without Delay Line, For Composite Laminate Material .....	WP008 02

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

## Support Equipment Required

## NOTE

Alternate item part numbers are shown indented.

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
—	Heat Lamp		
—	Hot Air Gun	1/8-Inch Thick, size as Required to Cover Repair	Metal Backup Plates
—	C-Clamp	—	Weights, for stacking (Amount as required to apply 5 pounds per square inch of repair area)



**Materials Required (Continued)****NOTE**

Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

EA956	Adhesive
EA9396 A/B	Adhesive
CCC-C-440	Cheesecloth
TYPE 1	
CLASS 1	
A-A-1047 GRIT	Abrasive Paper
240-9X11	
855-1.000IN.	Pressure Sensitive
	Tape
020X413	Cleaning Compound
GG-N-196	Hypodermic Syringe, No. 15
420	Sealant Gun Nozzle

a. Clean delamination or unbond per steps below:

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

(1) Fill hypodermic syringe with cleaning compound.

(2) Insert needle into edge of delamination or unbond and thoroughly flush with cleaning compound.

(3) Allow to air dry 15 minutes.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

**NOTE**

If tape will aid injection, tape edges of damaged area leaving small opening at each end.

b. Prepare adhesive (WP003 00).

c. To aid adhesive flow, preheat repair area to 100° to 110° F using heat lamp or hot air gun.

d. Fill hypodermic syringe with adhesive.

e. Insert needle into edge of delamination or unbond.

f. Inject adhesive into delamination or unbond until it flows clear.

g. Remove excess adhesive with clean dry cheesecloth.

h. Tape over delamination or unbond, if required.

i. Apply pressure to repair. Use metal backup plates with c-clamp or weights. Apply approximately 5 pounds pressure per square inch of repair area.

j. Cure adhesive (WP004 00).

k. Remove backup plates , c-clamp or weights, and tape if installed.

## WARNING

Sanding and cutting of graphite epoxy material produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

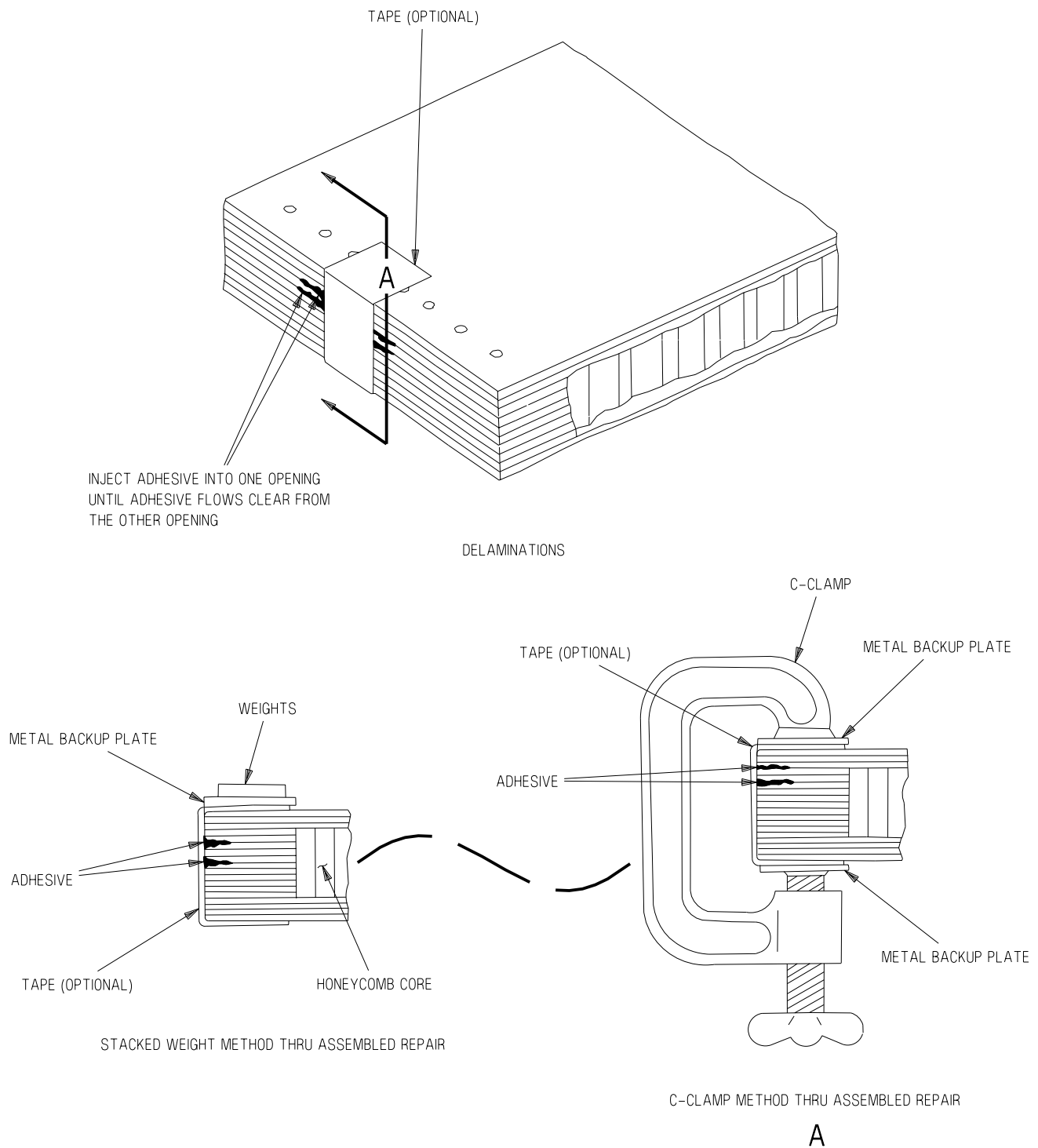
Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

## CAUTION

Be careful not to sand into part material, causing damage.

1. Sand area smooth using abrasive paper.

m. Do ultrasonic inspection of repair area to verify satisfactory injection and bonding of delamination or unbond (A1-F18AC-SRM-300, WP008 02).



**Figure 1. Class IV Damage Repair (Sheet 1)**

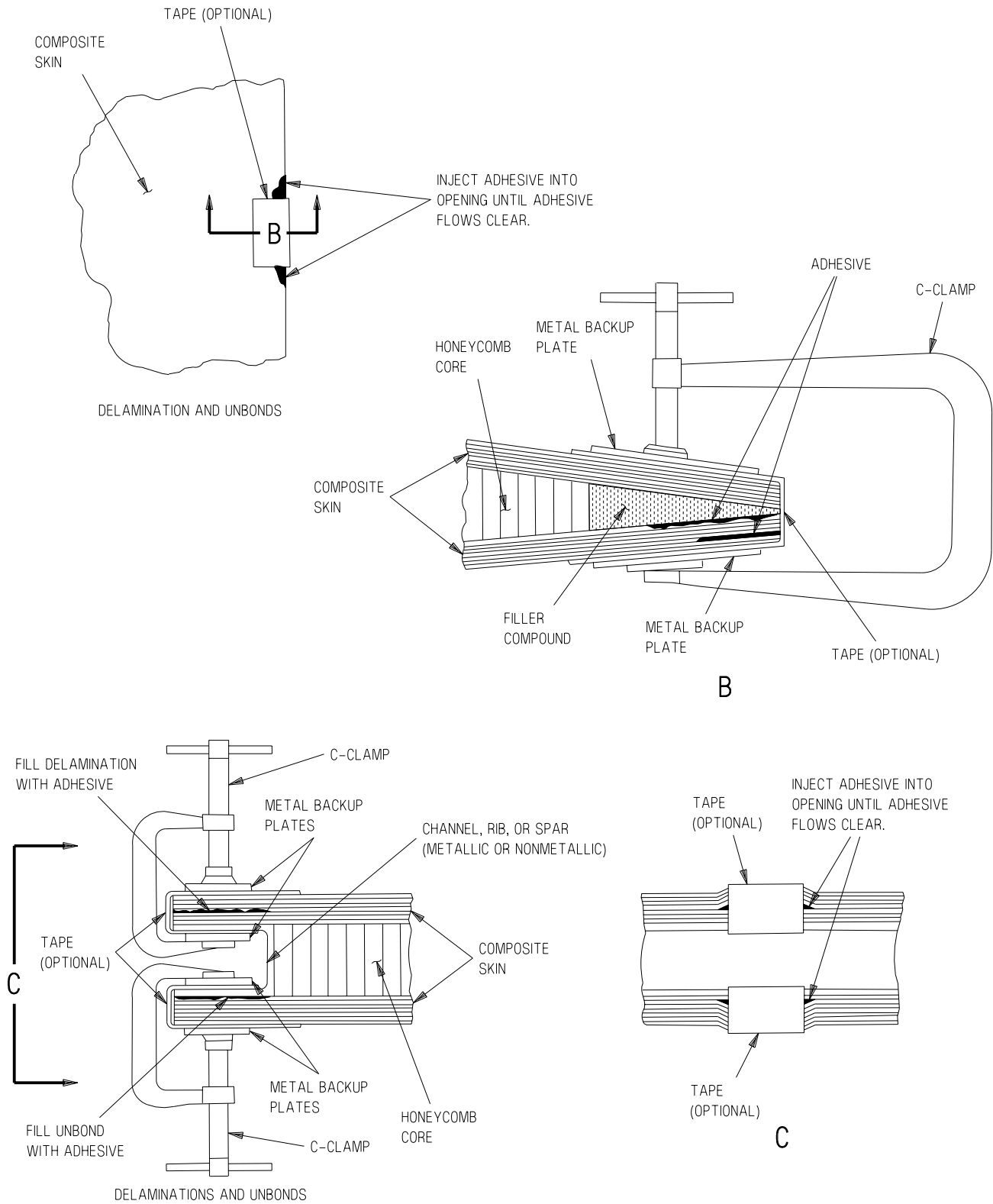
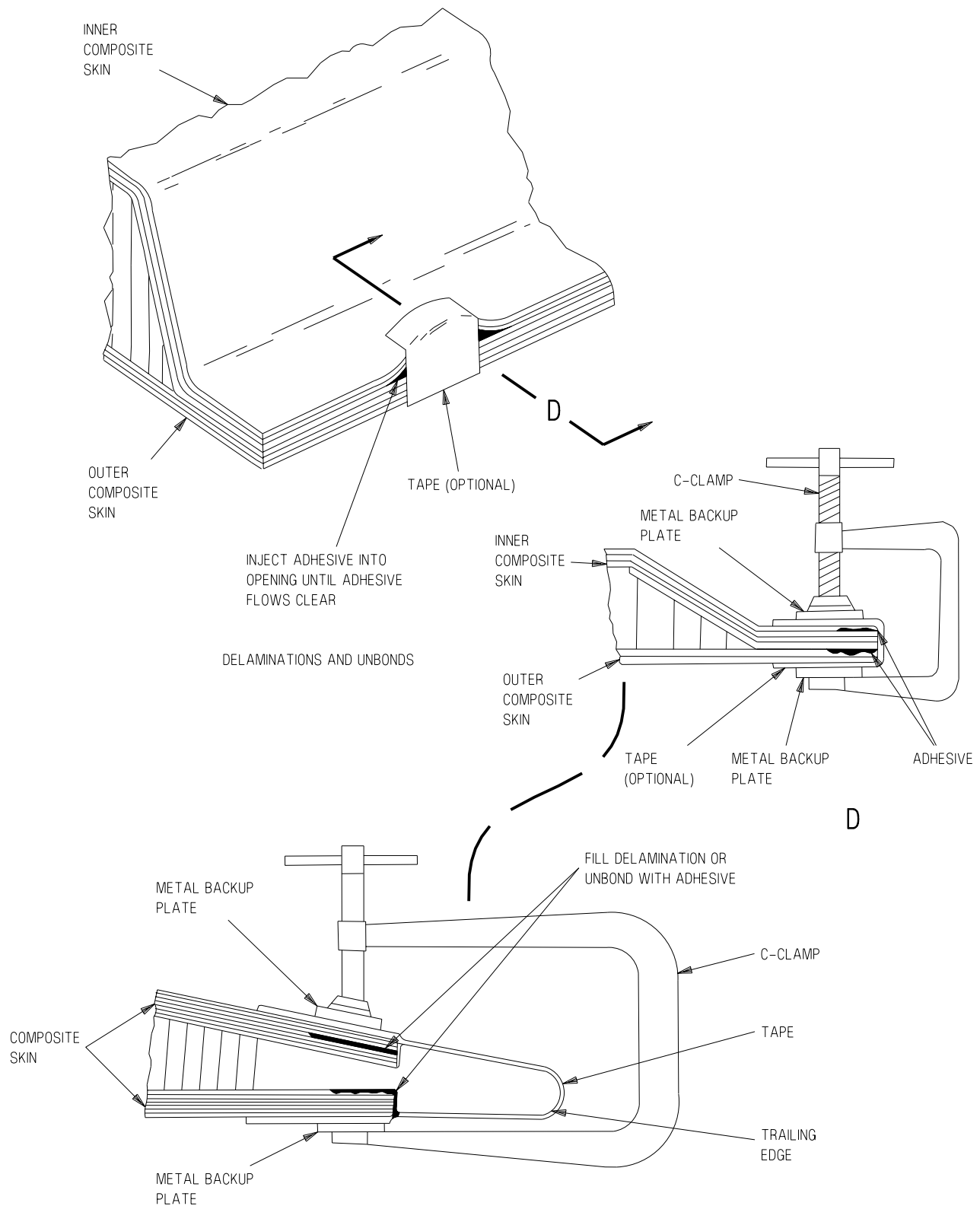


Figure 1. Class IV Damage Repair (Sheet 2)



**Figure 1. Class IV Damage Repair (Sheet 3)**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS V DAMAGE REPAIR

This WP supersedes WP016 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class IV Damage Repair .....	WP015 00
Structure Repair, General Information .....	A1-F18AC-SRM-200
Drilling and Machining Composites .....	WP004 08
Aircraft Corrosion Control .....	A1-F18AC-SRM-500
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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

2. This repair is applicable to loose or missing fibers, skin abrasions around fastener holes and/or countersinks, surface ply rips, and damaged fastener holes.

3. **LOOSE FIBERS AROUND FASTENER HOLES AND/OR COUNTERSINKS AND SURFACE PLY RIPS REPAIR.** See figure 1, details A and B.

## Support Equipment Required

None

**Materials Required****NOTE**

Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

EA956	Adhesive
EA9396 A/B	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
H-B-695 TYPE 1 GRADE A SIZE 1-1/2	Varnish Brush
A-A-1047 GRIT 320-9X11	Abrasive Paper
020X413	Cleaning Compound
MIL-A-41829	Utility Apron
ZZ-G-381, TYPE 1, STYLE 1	Chemical Gloves

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

**CAUTION**

Be careful not to break off loose fibers when cleaning damaged area.

a. Clean loose fibers by wiping with clean cheesecloth moistened with cleaning compound.

b. Allow to air dry 15 minutes.

c. If loose fibers cannot be lifted without being damaged to clean and brush apply adhesive, do Graphite Epoxy Skin and Aluminum Honeycomb Core, Class IV Damage Repair (WP015 00), except no follow up NDI is required.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Prepare adhesive (WP003 00).

e. Carefully lift loose fibers and brush apply adhesive to all mating surfaces.

f. Position loose fibers and wipe off excess adhesive with clean dry cheesecloth.

g. Cure adhesive (WP004 00).

**WARNING**

Wear face protection, apron, and gloves when sanding graphite epoxy. Sanding produces fine dust that may cause skin irritation. Breathing excessive amount of dust may be harmful to health.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

**CAUTION**

Be careful not to sand into laminates, causing damage.

h. Lightly sand smooth using abrasive paper.

#### 4. MISSING FIBERS AND/OR SKIN ABRASIONS REPAIR. See figure 1, detail A.

### Support Equipment Required

None

### Materials Required

Specification or Part Number	Nomenclature
EA9321 A/B	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
H-B-695 TYPE 1 GRADE A, SIZE 1-1/2	Varnish Brush
A-A-1047 GRIT 320-9X11	Abrasive Paper
020X413	Cleaning Compound
MIL-A-41829	Utility Apron
ZZ-G-381, TYPE 1, STYLE 1	Chemical Gloves

### WARNING

Wear face protection, apron, and gloves when sanding graphite epoxy. Sanding produces fine dust that may cause skin irritation. Breathing excessive amount of dust may be harmful to health.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

### CAUTION

Be careful not to sand into laminates, causing damage.

- a. Lightly sand damage area smooth using abrasive paper.

### WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

- b. Clean damage area by wiping with clean cheesecloth moistened with cleaning compound.

- c. Allow to air dry 15 minutes.

### WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- d. Prepare adhesive (WP003 00).

### NOTE

Be careful not to apply adhesive on fasteners.

- e. Fill damage with adhesive, flush with mold line.

- f. Cure adhesive (WP004 00).

### CAUTION

Be careful not to sand into laminates causing damage.

- g. Lightly sand area smooth using abrasive paper.

5. **DAMAGED FASTENER HOLES REPAIR.** See figure 1, detail C. Procedures below give two methods for repairing holes using plug rivets and



sleeves. Repair method one cleans holes up to 0.3350 inch diameter. Repair method two cleans holes up to 0.3995 inch diameter. Procedures for making repairs using either method and final hole sizes are determined by damage evaluation in applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials

### Materials Required

#### NOTE

Alternate item part numbers are shown indented.

Specification or Part Number	Nomenclature
MIL-A-41829	Utility Apron
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
MS20426B10-7	Rivet
MS20426B12-8	Rivet
ZZ-G-381, TYPE 1, STYLE 1	Chemical Gloves
MIL-S-83430, CLA-1/2	Sealing Compound
4M273C5-4	Sleeve
4M273C4-4	Sleeve
4M249C6-4	Sleeve
020X413	Cleaning Compound

**6. Repair Method One.** This repair is applicable to fastener hole having a maximum diameter of 0.3350 inch.

a. Observe general information, safety precaution, and requirements relating to Drilling and Machining Composites (A1-F18AC-SRM-200, WP004 08).

b. Drill fastener hole to 0.3330 +0.0020 -0.0000 inch diameter (A1-F18AC-SRM-200, WP004 08).

c. Countersink outer mold line hole 100 degrees to 0.490 +0.000 -0.010 inch diameter (A1-F18AC-SRM-200, WP004 08).

d. Countersink inner mold line hole 100 degrees to 0.403 +0.000 -0.010 inch diameter (A1-F18AC-SRM-200, WP004 08).

e. Insert flared end of 4M273C5-4 sleeve into outer mold line countersink. Nonflared end of sleeve shall be flush to 0.063 past inner mold line surface.

f. Observe general information and precautions relating to Priming Procedures (A1-F18AC-SRM-500, WP011 00).

g. Remove sleeve and apply two coats of primer to exterior of sleeve (A1-F18AC-SRM-500, WP011 00).

h. After primer has cured, install 4M273C5-4 sleeve per substeps below:

#### WARNING

Sealing compound is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

(1) Prepare sealing compound (WP003 00).

(2) Apply sealing compound to exterior of sleeve and insert into hole.

#### CAUTION

Make sure when flaring sleeve to apply limited pressure, avoiding damage to skin surface.

(3) Flare inner mold line end of sleeve applying squeeze pressure lightly. Flare shall be flush to 0.010 below mold line.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

(4) Wipe excess sealing compound from sleeve and surrounding surface with clean cheesecloth dampened with cleaning compound. Allow to air dry 15 minutes.

(5) Inspect sleeve. If cracks or splits exist, remove sleeve and repeat steps e through h.

(6) Cure sealing compound (WP004 00).

(7) After cure, inspect sleeve to make sure sleeve is tight and will not rotate when applicable fastener is installed. If sleeve rotates, replace sleeve.

i. Apply primer to MS20426B10-7 rivet (A1-F18AC-SRM-500, WP011 00).

j. Install rivet in sleeve using squeeze method.

k. Wipe excess primer from repair area using clean cheesecloth dampened with cleaning compound. Allow to air dry 15 minutes.

l. Trim rivet flush and smooth with inner and outer mold line surfaces.

m. Wipe repair with clean dry cheesecloth.

n. Drill and countersink fastener holes to original size per blueprint and applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.

**7. Repair Method Two.** This repair is applicable to fastener hole having a maximum diameter of 0.3995 inch.

a. Observe general information, safety precaution, and requirements relating to Drilling and Machining Composites (A1-F18AC-SRM-200, WP004 08).

b. Drill fastener hole to  $0.3975 +0.0020 -0.0000$  inch diameter.

c. Countersink outer mold line hole 100 degrees to  $0.540 +0.000 -0.005$  inch diameter (A1-F18AC-SRM-200, WP004 08).

d. Countersink inner mold line hole 100 degrees to  $0.468 +0.000 -0.010$  inch diameter (A1-F18AC-SRM-200, WP004 08).

e. Insert flared end of 4M249C6-4 sleeve into outer mold line countersink. Nonflared end of sleeve shall be flush to 0.063 past inner mold line surface.

f. Observe general information and precautions relating to Priming Procedures (A1-F18AC-SRM-500, WP011 00).

g. Remove sleeve and apply two coats of primer to exterior of sleeve (A1-F18AC-SRM-500, WP011 00).

h. After primer has cured, install 4M249C6-4 sleeve per substeps below:

**WARNING**

Sealing compound is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

(1) Prepare sealing compound (WP003 00).

(2) Apply sealing compound to exterior of sleeve and insert into hole.

**CAUTION**

Make sure when flaring sleeve to apply limited pressure, avoiding damage to skin surface.

(3) Flare inner mold line end of sleeve, applying squeeze pressure lightly. Flare shall be flush to 0.010 below mold line.

## WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

(4) Wipe excess sealing compound from sleeve and surrounding surface with clean cheesecloth dampened with cleaning compound. Allow to air dry 15 minutes.

(5) Inspect sleeve. If cracks or splits exist, remove sleeve and repeat steps e through h.

(6) Cure sealing compound (WP004 00).

(7) After cure, inspect sleeve to make sure sleeve is tight and will not rotate when applicable fastener is installed. If sleeve rotates, replace sleeve.

i. Apply primer to MS20426B12-8 rivet. (A1-F18AC-SRM-500, WP011 00).

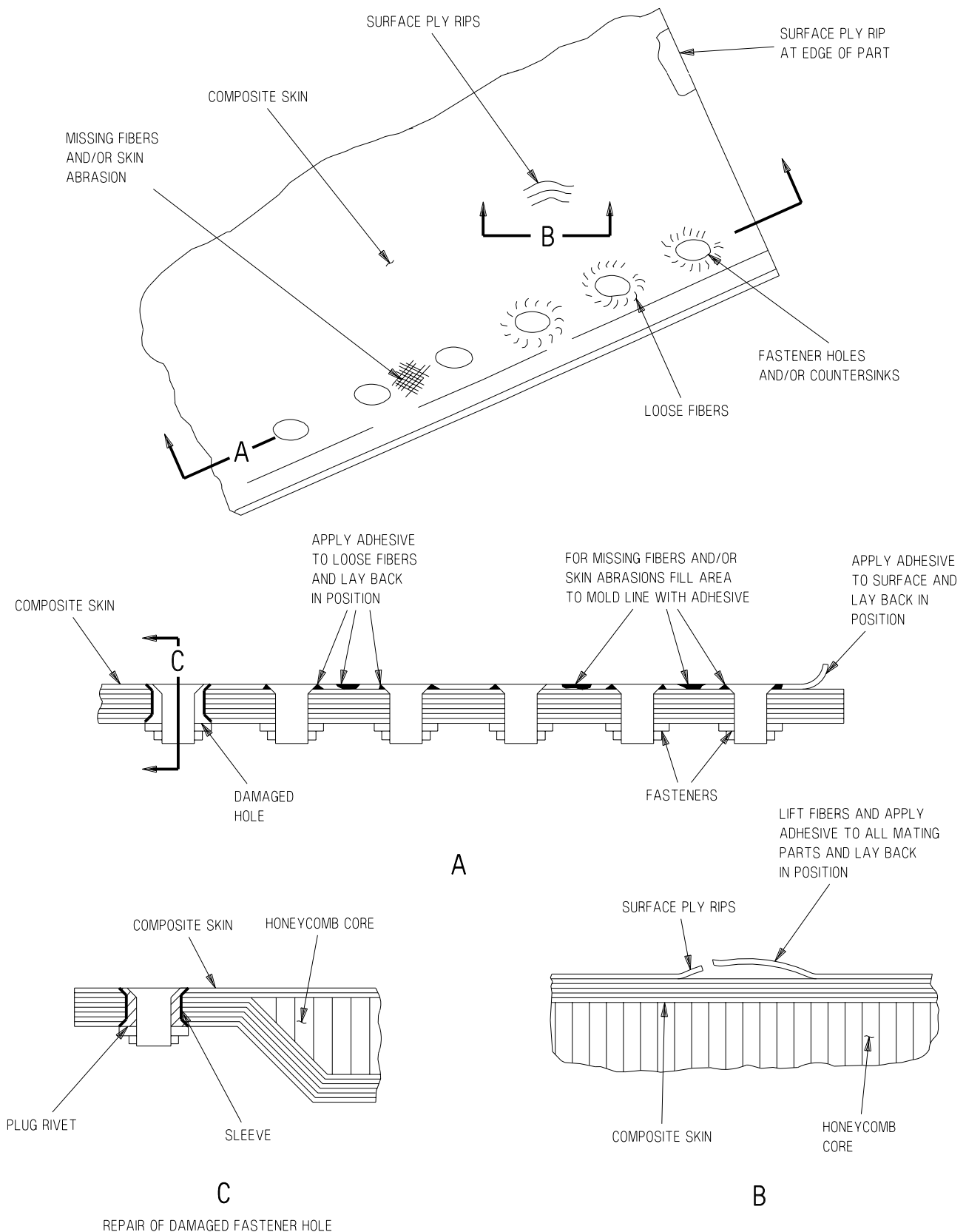
j. Install rivet in sleeve using squeeze method.

k. Wipe excess primer from repair area using clean cheesecloth dampened with solvent.

l. Trim rivet flush and smooth with inner and outer mold line surfaces.

m. Wipe repair clean with clean dry cheesecloth.

n. Drill and countersink fastener holes to original size per blueprint and applicable structure repair series A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 manuals.





## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS VI DAMAGE REPAIR

## Reference Material

Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honey- comb Core .....	WP008 01
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Aluminum, Graphite Epoxy, Or Titanium Patch Installation and Removal...	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

## Support Equipment Required

None

Specification  
or Part Number

## Nomenclature

200SG40TR	Plastic Sheet
EA9321 A/B	Adhesive
CCC-C-440, TYPE 1, CLASS 1	Cheesecloth
855-1-000 IN.	Pressure Sensitive Tape
ZZ-G-381, TYPE 1 STYLE 1	Rubber Gloves
GG-D-223	Metal Spatula
A-A-1047, GRIT 180-9X11, 240-9X11	Paper, Abrasive

## WARNING

Sanding and cutting of graphite epoxy skin produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

## CAUTION

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

a. Do NDI to determine maximum amount of below surface damage, cuts, scratches, cracks, erosion and skin delaminations. Mark these determinations on the skin (A1-F18AC-SRM-300, WP008 01).

## CAUTION

Make sure when removing damage, not to penetrate through skin. If skin is penetrated, do class VII repair.

b. Sand area using 80 grit abrasive paper to depth indicated by NDI. Remove damage to a circular configuration.

c. Vacuum clean repair area.

## CAUTION

To prevent more damage, avoid sanding into base material when removing finish.

d. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper. Complete surface preparation using 240 grit abrasive paper.

e. Vacuum dust from repair area. Wipe surface clean with dry cheesecloth.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

f. Prepare adhesive (WP003 00).

g. Fill void with adhesive using a spatula. Work thoroughly into void to avoid air pockets. Trowel level with surface. Add excess adhesive to allow for shrinkage.

h. Cover adhesive with plastic sheet and cure repair (WP004 00).

## CAUTION

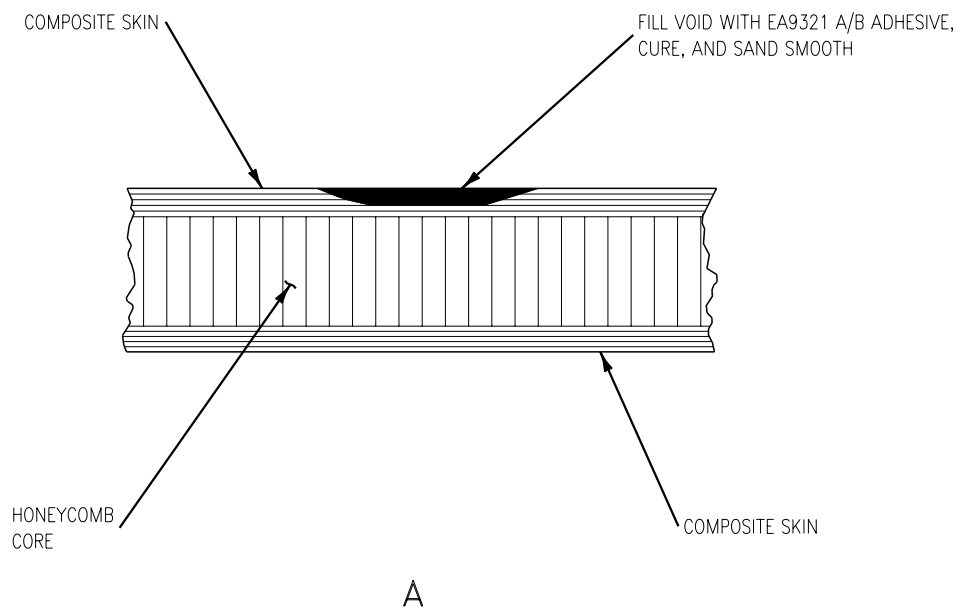
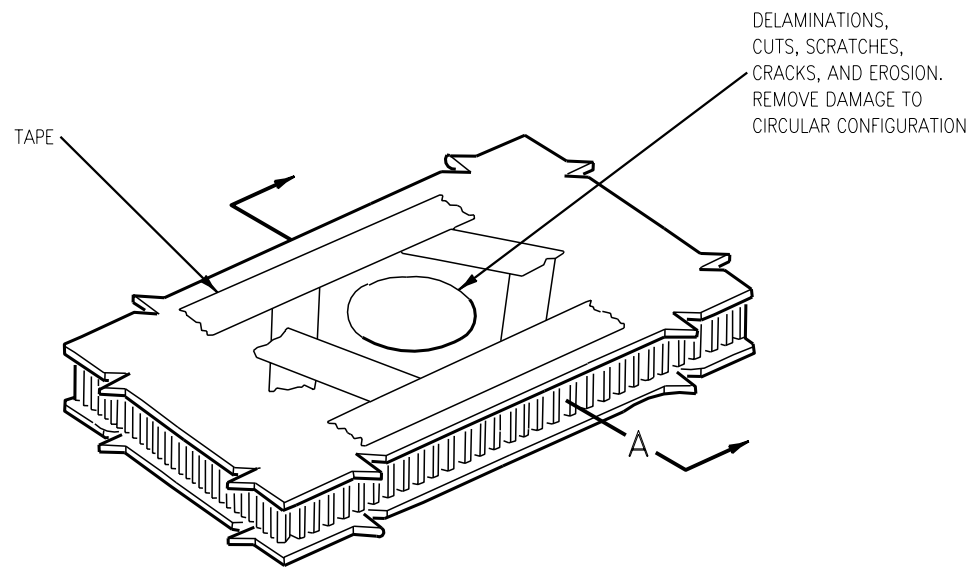
Be careful not to sand into base material, causing damage.

i. Remove tape and plastic sheet. Sand repair surface smooth using 240 grit abrasive paper.

j. Do NDI to make sure void is filled (A1-F18AC-SRM-300, WP008 01). If void is filled, go to step k. If not filled, reclassify the damage. Refer to applicable structure repair manual.

k. If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual, install applicable patches (WP007 00).

l. If patch has been installed, do NDI on patch to verify bond line integrity (A1-F18AC-SRM-300, WP008 01).



**Figure 1. Class VI Damage Repair**





## ORGANIZATIONAL AND INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS VII OR ALUMINUM  
SKIN AND ALUMINUM HONEYCOMB CORE, CLASSES V, VI OR VII DAMAGE REPAIR

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Storage, Preparation and Handling Procedures for Structural Adhesives.....	WP 003 00
Water Removal.....	WP 005 00
Router Holder, Adjustable Part No. IED84-232 .....	WP 006 02
Aluminum, Carbon Epoxy and Titanium Patch Installation and Removal ....	WP 007 00
General Composite Repair.....	NAVAIR 01-1A-21

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## Record of Applicable Technical Directives

None

## 1. PROCEDURE.

2. The procedures contained in this work package provide two categories of repair for carbon epoxy or aluminum skin and aluminum honeycomb core sandwich structure using EA9321 paste adhesive for core repair. See figure 1 for process flow diagram. The categories with type repairs are:

a. Damage over one and one half inches diameter, intermediate maintenance repair (Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Classes V and VII).

b. Damage one and one half inches diameter or less, organizational maintenance repair (Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Class VI).

3. DAMAGE OVER ONE AND ONE HALF  
INCHES DIAMETER, INTERMEDIATE  
MAINTENANCE REPAIR. See figure 2.

## Support Equipment Required

Part Number or Type Designation	Nomenclature
4SE01754	Hepa Filter Vacuum Cleaner
74D110172-1001	Tool Set - Structural Repair, Composite Materials

### Support Equipment Required (Continued)

Part Number or Type Designation	Nomenclature
74D110172-2001 Commercial Availability	Core Slicer Needle Nose Pliers
CJ-814-1 Commercial Availability	File, Rotary Straight Edge
0.100 Thick Steel, Aluminum or Titanium (Size as Required for Patch Installation)	Metal Backup Plate
GG-D-226 Commercial Availability	Depressor, Tongue External Weight (3-5 pounds)
IED84-232	Router Holder
10L1281-36 DOTCO	90° Router motor
10L2081-C-01 DOTCO	0° Router motor

### Materials Required

#### NOTE

Alternate item specifications or part numbers are shown indented.

Specification of Part Number	Nomenclature
855 1 IN	Tape, Pressure Sensitive
200SG40TR	Plastic Sheet (Release Film)
135001-1001, -1003, -1005, -1007, -1009, and -1011	Honeycomb Core Kit
EA9321 A/B —	Paste Adhesive Glass Floc, 0.070±0.040 Inch Glass Fibers
CCCC440TY1CL1 RYMPLE CLOTH- 301-PURIFIED	Cloth, Cheesecloth Cloth, Cleaning
ZZ-G-381 TYPE 1 STYLE 1	Gloves, Chemical
E-007	Gloves, Surgeon
MIL-G-3866 TYPE 1	Gloves, Cotton

### Materials Required (Continued)

#### NOTE

Alternate item specifications or part numbers are shown indented.

D 1153	Methyl Isobutyl Ketone Analyzed Reagent
250-CP2-1/2 420	Sealing Gun Cartridge Sealant, Gun Nozzle
MIL-B-121 TYPE 2 GRADE A CLASS 1	Barrier Material (Kraft Paper)
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive
—	Abrasive disk, 80 grit Silicon carbide

a. Mask around repair area with pressure sensitive tape. Tape should extend 2 inches past edge of area where repair patch is to be installed. If both skins have damage mask around damage area on both skins.

#### WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid open flames, heat sources and grinding operations.

b. Wearing clean disposable latex gloves thoroughly degrease the surface using methyl isobutyl ketone and cheesecloth or rymple cloth (change gloves after 5 minutes or sooner if contaminated). A clean cheesecloth or rymple cloth must be used for each wipe. Continue until cheesecloth or rymple cloth remains clean.

c. Remove paint and primer in masked area per WP 007 00. Vacuum clean area to remove sanding and paint residue and wipe with dry cheesecloth or rymple cloth.

## WARNING

Sanding and cutting of carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount of dust may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Health and Safety.

## CAUTION

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract dust away from aircraft and electrical equipment.

d. Remove damage as noted below:

## CAUTION

Be careful during core removal not to cause delamination/disbonding of skin to which core is bonded.

(1) Damage to both skins:

(a) Remove damage to both skins to circular configuration. Align cut-outs through both skins.

(b) Using core slicer, carefully slice down cell walls parallel to the cell axis. Remove core completely to opposite skin cut out.

(c) Visually inspect core cavity for fluid. If fluid other than water exist, seek engineering disposition.

(2) Damage to single skin:

(a) Remove damaged skin to a circular configuration.

(b) Using core slicer, carefully slice down cell walls parallel to the cell axis.

(c) Remove separated core using needle nose pliers and a careful twisting and pulling motion.

## NOTE

High density core is difficult to remove and may require the use of an 80 grit sanding disk and a router motor. Do not sand into paste adhesive or damage core material

(d) Visually inspect core cavity for fluid. If fluid other than water exists, seek engineering disposition. If water exists, cut out opposite side skin and do repair for damage to both skins.

## CAUTION

Do not damage undamaged skin when sanding.

(e) For metallic skins, lightly hand sand core residue and paste adhesive surface inside undamaged skin. Do not sand through paste adhesive. If paste adhesive is loose or sanded through during the hand sanding process, remove opposite skin and do repair for damage to both skins.

(f) For carbon epoxy skins, hand sand core residue and paste adhesive surface to expose carbon epoxy laminate be careful not to sand into laminate.

e. Vacuum clean repair core cavity and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

## CAUTION

Wear clean cotton gloves when handling honeycomb core to prevent contamination.

f. Determine part core density and ribbon direction from the part specific structural repair manual (A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -760). Select a replacement core material from table 1 per parts specific structural repair manual. If a core splice

exists in the area being repaired (as indicated by presence of core splice material) select the higher density core section to be the replacement core. Core section is to extend past the outer mold line(s) by 0.05 to 0.10.

g. Using a core slicer, cut honeycomb core plug to fit tightly inside cut out. Allow less than one hexagonal cell around cut out and core plug. Make sure core plug ribbon direction matches part core ribbon direction.

## WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

h. Flush core plug with methyl isobutyl ketone to remove any contaminants and allow to dry.

i. Insert core plug in cavity and do water removal (if required) per WP 005 00. With core plug inserted in cavity, dry part per WP 005 00.

j. Remove core plug from core cavity. Apply tape over part skin in repair area. Leave core cavity untapped.

k. For single skin damage, prepare inner carbon epoxy skin surface per WP 007 00. For aluminum skin, prepare inner skin surface as noted below:

(1) Lightly sand with 240 grit abrasive paper be careful not to sand through paste adhesive. If aluminum surface is exposed remove skin per step 3d(1)(a).

(2) Vacuum clean repair core cavity and wipe inner skin surface clean with clean dry cheesecloth or rymple cloth.

## WARNING

Paste adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

l. Prepare EA9321 paste adhesive per WP 003 00.

m. The listed steps are applicable to single skin damage:

(1) Inject approximately 0.10 thick layer of paste adhesive over complete area of far side of lower skin.

(2) Insert plug into repair cut out, push plug against other skin. Remove plug and confirm contact between core plug and paste adhesive. Add more paste adhesive as required to make sure contact.

(3) Using tongue depressor, apply paste adhesive around core plug and to exposed core cavity cell walls.

(4) Carefully press core plug into cut out. Make sure replacement core ribbon direction is same as part core ribbon direction. Wipe away any excess paste adhesive. Visually inspect to verify core plug cell wall to part core gap cell wall is filled with paste adhesive. If not, inject more paste adhesive into gap to fill void(s).

(5) Apply pressure for setting the paste adhesive by placing release film and a metal plate on top of core plug. Apply an external weight (approximately 3-5 pounds) on top of metal plate.

n. The listed steps are applicable for damage to both skins:

(1) Using tongue depressor, apply paste adhesive around core plug and exposed core that will mate with repair core plug.

(2) Carefully press core plug into cut out. Make sure replacement core ribbon direction is same as part core ribbon direction. Wipe away any

excess paste adhesive. Visually inspect to verify core plug to part core gap is filled with paste adhesive. If not, inject more adhesive into gap to fill void(s).

(3) Position release film over both sides of the core plug and then apply pressure sensitive tape to hold core plug in position and to stop paste adhesive running out of core plug to part core gap.

o. Allow paste adhesive to set at room temperature for 8 hours. As an alternate allow paste adhesive to set at room temperature for 2 hours and by heating with a heat lamp to  $150\pm 10^{\circ}\text{F}$  for 1 hour. Operate the heat lamp per NAVAIR 01-1A-21.

p. Remove weight, metal plate (if used) and release film.

q. Machine core flush with outer mold line surface(s) using a 0 degree router motor, a router holder IED84-232 (WP 006 02) and burr special cutter as noted below:



Be careful not to cut into part skin or to undercut core.

(1) Install the burr cutter in the router motor and the router motor in the router holder.

(2) Adjust the router motor so that the cutting edge of the burr special cutter is flush with the tape on the outer mold line surface of the part.

(3) Using the part surface as a guide, carefully machine core plug flush with tape on outer mold line surface of part. Start by machining around core periphery. Be careful not to cut into the part skin or to undercut core.

r. Remove tape on outer mold line surface (s) of part. Inspect core plug cell for areas of rolled over cell walls. Lightly finish sand core flush with outer mold line surface and to remove any rolled over cell walls using 180 to 240 grit abrasive paper and a sanding block.

s. Using a straight edge that extends past the machined core and on the part surface, make sure the surface of the machined core plug is flush with the surrounding part surface. If the core plug is higher than the part surface, locally finish sand core with outer mold line surface of part. If core plug is

lower than part surface, make it flush with part surface by locally filling with EA9321 paste adhesive and set paste adhesive per step 3o and then sand flush to outer mold line surface.

t. Vacuum clean core plug and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

u. Visually inspect core splice bond line for voids. If no void is found, go to next step. If void is found, carry out the sub-steps listed below:

(1) Prepare EA 9321 paste adhesive per WP 003 00.

(2) Fill voids using paste adhesive.

(3) Set paste adhesive per step 3o.

(4) Sand surface smooth using 180 to 240 grit abrasive paper.

(5) Vacuum clean core plug and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

(6) Cover exposed area(s) with clean wax free kraft paper and tape in position.

v. Select patch(es) per part specific structural repair manual (A1-F18AC-SRM-210 through -240 or A1-F18AC-SRM-600 through -760).

w. If patch(es) will be installed with FM300 or FM300-2 film paste adhesive, do preparation of part and/or patch surface for bonding and patch installation per WP 007 00. If patch(es) will be installed with EA9321 paste adhesive carry out the sub-steps listed below:

### NOTE

Patch(es) installed with EA9321 paste adhesive should be installed immediately after the EA9321 paste adhesive is applied to the repair cavity and cured simultaneously.

(1) Cover skin(s) around repair cutout with pressure sensitive tape. Tape should extend 2 inches past cutout.

(2) Do preparation of part and/or patch surface for bonding per WP 007 00. Vacuum clean repair area and honeycomb core. Wipe skin surface clean with cheesecloth or rymple cloth.

(3) Prepare filler by mixing 14 parts (by weight) chopped glass floc with EA9321 paste adhesive per WP 003 00.

(4) Apply filler into repair cavity in 100 gram increments using a tongue depressor, ensuring that filler penetrates 0.25 inch into open core cells. Avoid trapping air in filler when applying to repair cavity. Wait two hours between applications.

(5) Visually inspect to make sure repair cavity is filled. If repair cavity is filled go to next step. If not filled, apply more filler.

(6) Do patch installation per WP 007 00.

#### 4. DAMAGE ONE AND ONE-HALF INCHES DIAMETER OR LESS, ORGANIZATIONAL MAINTENANCE REPAIR. See figure 3.

#### Support Equipment Required

Specification or Part Number	Nomenclature
4SE01754	Hepa Filter Vacuum Cleaner
74D110172-1001	Tool Set - Structural Repair, Composite Materials
1.00 Thick Steel, Aluminum or Titanium (Size as Required for Patch Installation)	Metal Backup Plate
74D110172-2001	Core Slicer
GG-D-226	Depressor, Tongue
Commercial Availability	Needle Nose Pliers

#### Materials Required

##### NOTE

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
EA9321 A/B	Paste Adhesive
CCCC440TY1CL1	Cloth, Cheesecloth
RYMPLE CLOTH-301-PURIFIED	Cloth, Cleaning
855 1 IN	Tape, Pressure Sensitive
200SG40TR	Plastic Sheet, Release Film
ZZ-G-381 TYPE 1 STYLE 1	Gloves, Chemical
E-007	Gloves, Cotton
D 1153	Methyl Isobutyl Ketone Analyzed Reagent
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive
—	Glass Floc, 0.070±0.040 Inch Glass Fibers
MILC9084TY8CL2	Cloth, Satin (181 Fiberglass)

a. Mask around repair area with pressure sensitive tape. Tape should extend 2 inches past edge of area where repair patch is to be installed. If both skins have damage mask around damage area on both skins.

#### WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

b. Wearing clean disposable latex gloves thoroughly degrease the surface using solvent and cheesecloth or rymple cloth (change gloves after 5 minutes or sooner if contaminated). A clean cheesecloth or rymple cloth must be used for each



wipe. Continue until cheesecloth or rymple cloth remains clean.

c. Remove paint and primer in masked area per WP 007 00. Vacuum clean area to remove sanding and paint residue wipe with dry cheesecloth or rymple cloth.

## WARNING

Sanding and cutting of carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount of dust may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Health and Safety.

## CAUTION

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract dust away from aircraft and electrical equipment.

d. Remove damage per as noted below:

## CAUTION

Be careful during core removal not to cause delamination/disbonding of skin to which core is bonded.

(1) Damage to both skins:

(a) Remove damage to both skins to circular configuration. Align cut outs through both skins.

(b) Using core slicer, carefully slice down cell walls parallel to the cell axis. Remove core completely to opposite skin cut out.

(c) Visually inspect core cavity for fluid. If fluid other than water exist, seek engineering disposition.

(2) Damage to single skin:

(a) Remove damaged one side to a circular configuration.

(b) Using core slicer, carefully slice down cell walls parallel to the cell axis. Remove core completely down to undamaged skin leaving core cutout same as skin cutout.

(c) Remove separated core using needle nose pliers and a careful twisting and pulling motion.

## NOTE

High density core is difficult to remove and may require the use of an 80 grit sanding disk and a router motor. Do not sand into paste adhesive or damage core material.

(d) Visually inspect core cavity for fluid. If fluid other than water exists seek engineering disposition. If water exist, cut out opposite side skin and do repair for damage to both skins.

## CAUTION

Do not damage undamaged skin when sanding.

(e) For metallic skins, lightly hand sand core residue and paste adhesive surface inside undamaged skin. Do not sand through paste adhesive. If paste adhesive is loose or sanded through during the hand sanding process, remove opposite skin and do repair for damage to both skins.

(f) For carbon epoxy skins, hand sand core residue and paste adhesive surface to expose carbon epoxy laminate be careful not to sand into laminate.

e. Vacuum clean repair cavity to remove sanding/machining residue. Dry wipe surface clean using clean dry cheesecloth or rymple cloth.

f. Cover hole(s) on part surfaces with perforated plastic sheet(s) and breather cloth and tape in position. Tape metal plate(s) over plastic sheet(s) and breather cloth. If hole does not exist on lower surface, install plate on lower surface for supporting skin.



g. Do water removal (if required) and dry part per WP 005 00.

h. Remove plate(s), breather cloth, and perforated plastic sheet(s). If both skins have been removed, tape plastic sheet and plate to lower surface.

i. For single skin damage, prepare inner carbon epoxy skin surface per WP 007 00. For aluminum skin, prepare inner skin surface as noted below:

(1) Lightly sand with 240 grit abrasive paper be careful not to sand through paste adhesive. If aluminum surface is exposed remove skin and do repair for damage to both skins.

(2) Vacuum cavity and dry wipe with clean dry cheesecloth or rymple cloth.

j. Cover skin(s) around repair cutout with pressure sensitive tape. Tape should extend 2 inches past cutout.

k. Prepare filler by mixing 14 parts (by weight) chopped glass floc with EA9321 paste adhesive per WP 003 00.

l. Apply filler into repair cavity in 100 gram increments using a tongue depressor. Avoid trapping air in filler when applying to repair cavity. Wait two hours between applications.

m. When repair cavity is completely filled, add excess filler for any shrinkage.

n. Allow filler to set at room temperature for 8 hours. As an alternate, allow paste adhesive to set at room temperature for 2 hours and by heating with a heat lamp to 150±10°F for 1 hour. Operate the heat lamp per NAVAIR 01-1A-21.

o. After filler has set, remove release film and plate (if installed). Using 180 grit abrasive paper, sand excess filler.

p. Remove pressure sensitive tape from repaired area and sand filler with 180 to 240 grit abrasive paper. Sand filler flush with skin. Vacuum clean repair area. Wipe surface clean with cheesecloth or rymple cloth.

q. Visually inspect to make sure repair cavity is filled. If repair cavity is filled go to next step. If not filled, apply more filler.

r. Select patch(es) per part specific structural repair manual (A1-F18AC-SRM-210 through -240 or A1-F18AC-SRM-600 through -760).

s. Do preparation of part and/or patch surface for bonding and patch installation per WP 007 00.

**TABLE 1. HONEYCOMB CORE KIT**

PART NO 13501	CORE DENSITY	LENGTH	WIDTH	THICKNESS
-1001	1/8 CELL X 0.0015	9 INCH	9 INCH	2 INCH
-1003	1/8 CELL X 0.0015	9 INCH	9 INCH	4 INCH
-1005	1/8 CELL X 0.0015	9 INCH	9 INCH	6 INCH
-1007	3/16 CELL X 0.001	12 INCH	12 INCH	2 INCH
-1009	3/16 CELL X 0.001	12 INCH	12 INCH	4 INCH
-1011	3/16 CELL X 0.001	12 INCH	12 INCH	6 INCH

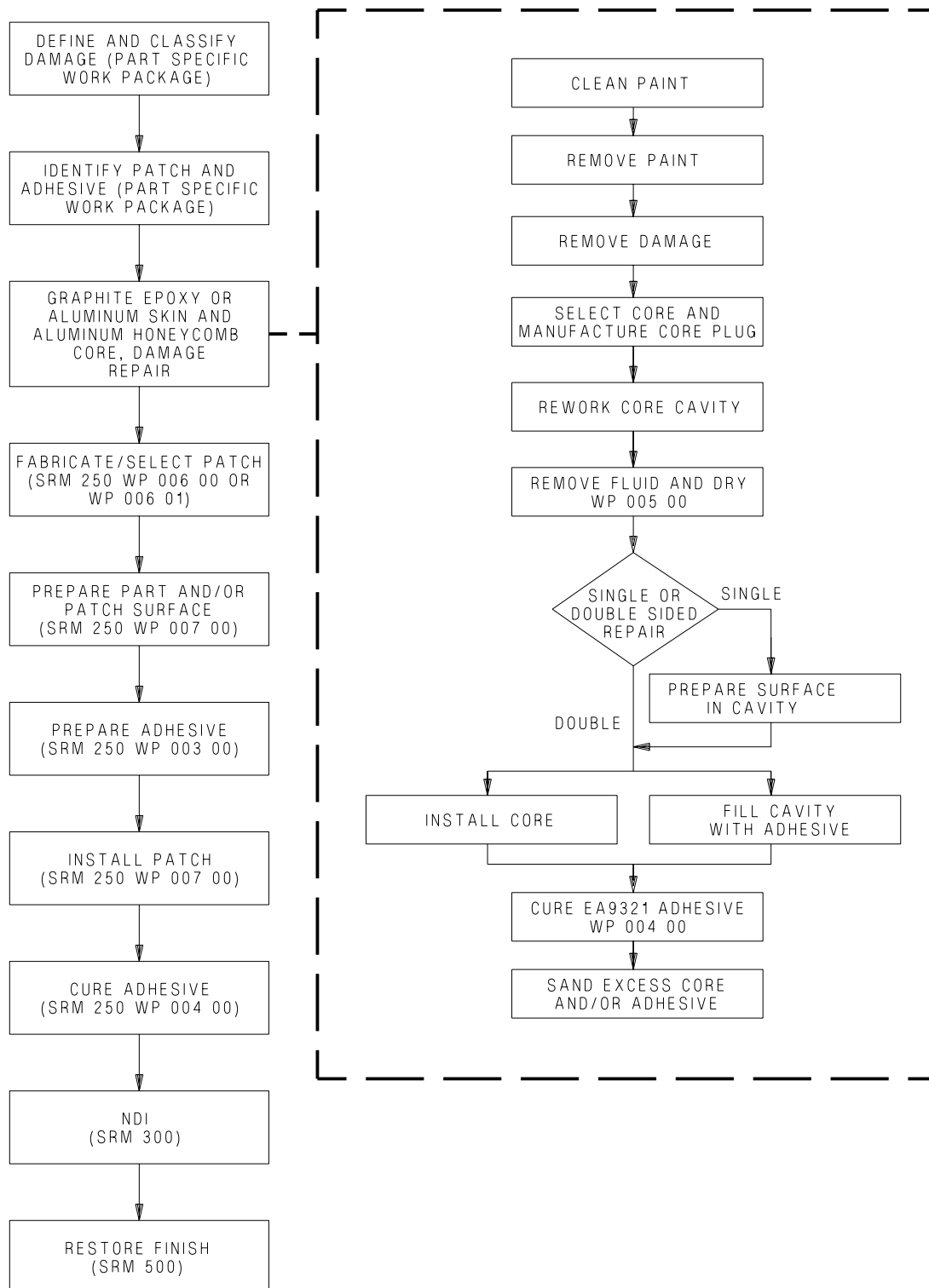
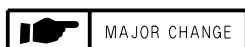
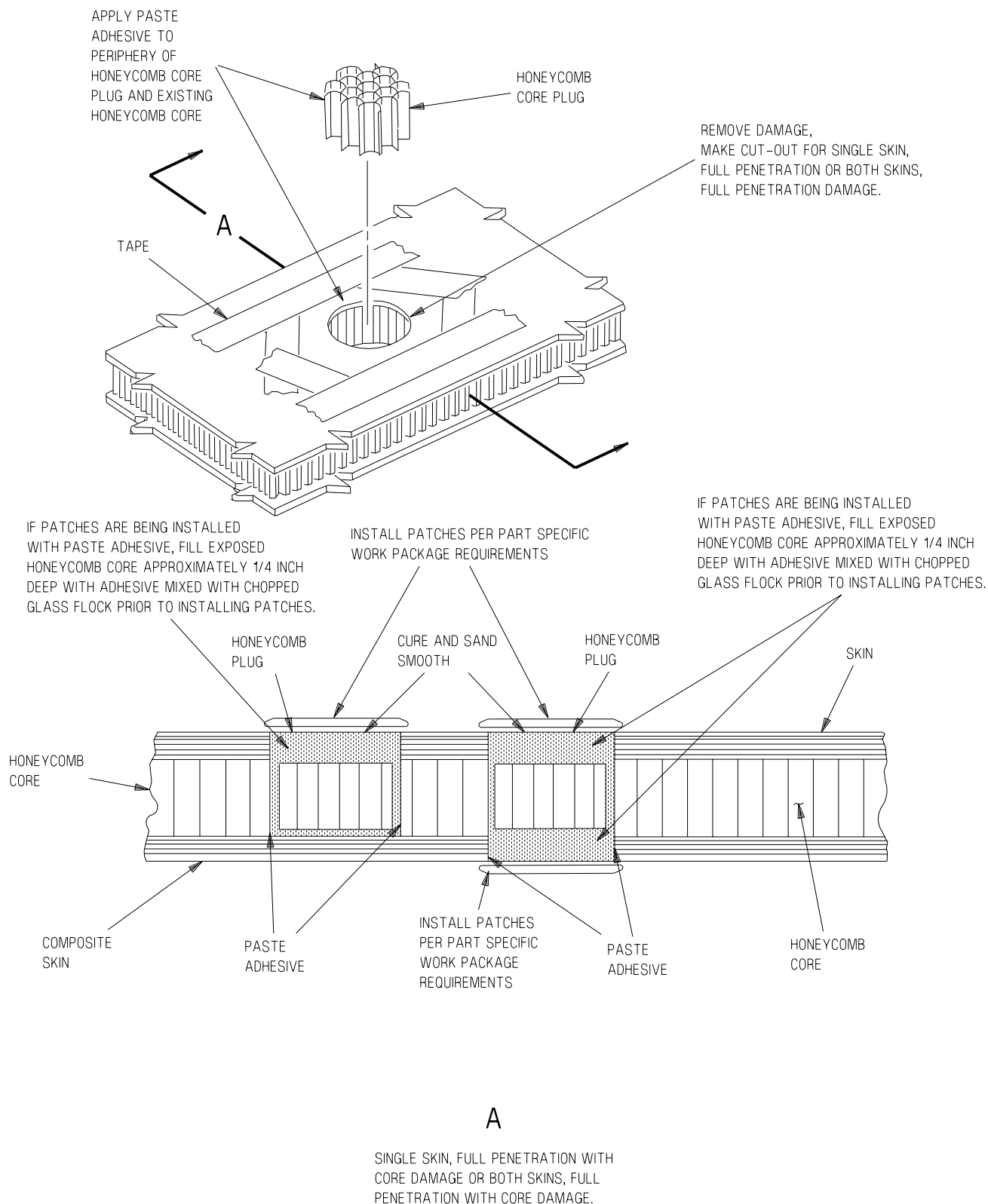


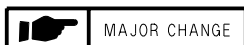
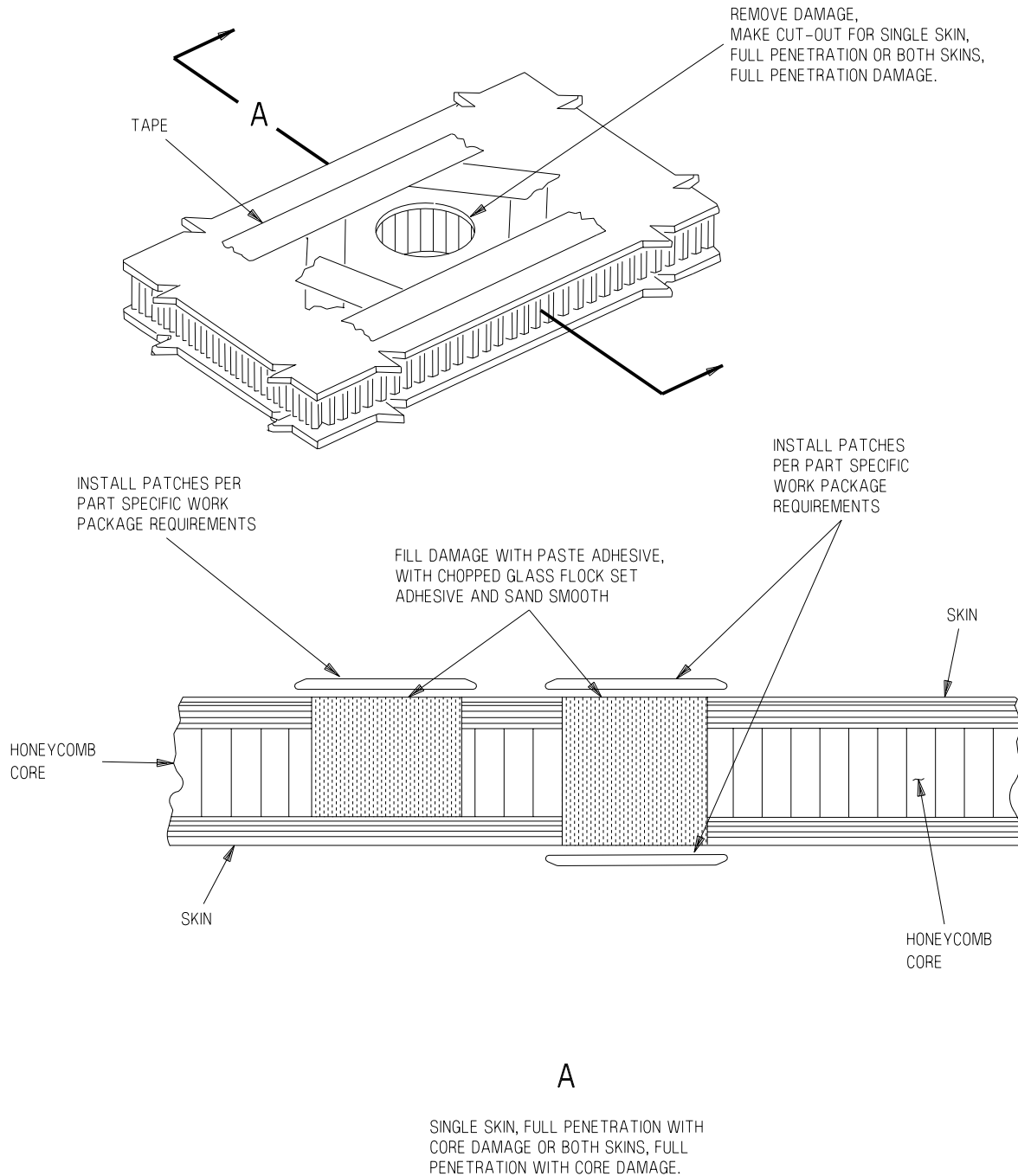
Figure 1. Process Flow



MAJOR CHANGE

ADA790-25-1-039

**Figure 2. Damage Repair, Over One and One-Half Inches in Diameter**



**Figure 3. Damage Repair, One and One-Half Inches in Diameter or Less**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS IX DAMAGE REPAIR

## Reference Material

Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core.....	WP008 01
Structure Repair, Typical Repair.....	A1-F18AC-SRM-250
Material Preparation.....	WP003 00
Curing of Repair.....	WP004 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

## Support Equipment Required

## NOTE

Alternate item specification or part numbers are shown indented.

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials	CCC-C-440, TYPE 1, CLASS 1 EA956 A/B EA9396 A/B A-A-1047, GRIT 180-9X11 240-9X11	Cheesecloth Adhesive Adhesive Paper, Abrasive

## WARNING

Sanding of graphite epoxy material produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

a. Remove loose or protruding fibers. Smooth sharp edges to 0.06 minimum radius using 180 grit abrasive paper. Complete surface preparation using 240 grit abrasive paper.

b. Clean damage area by wiping with clean dry cheesecloth.

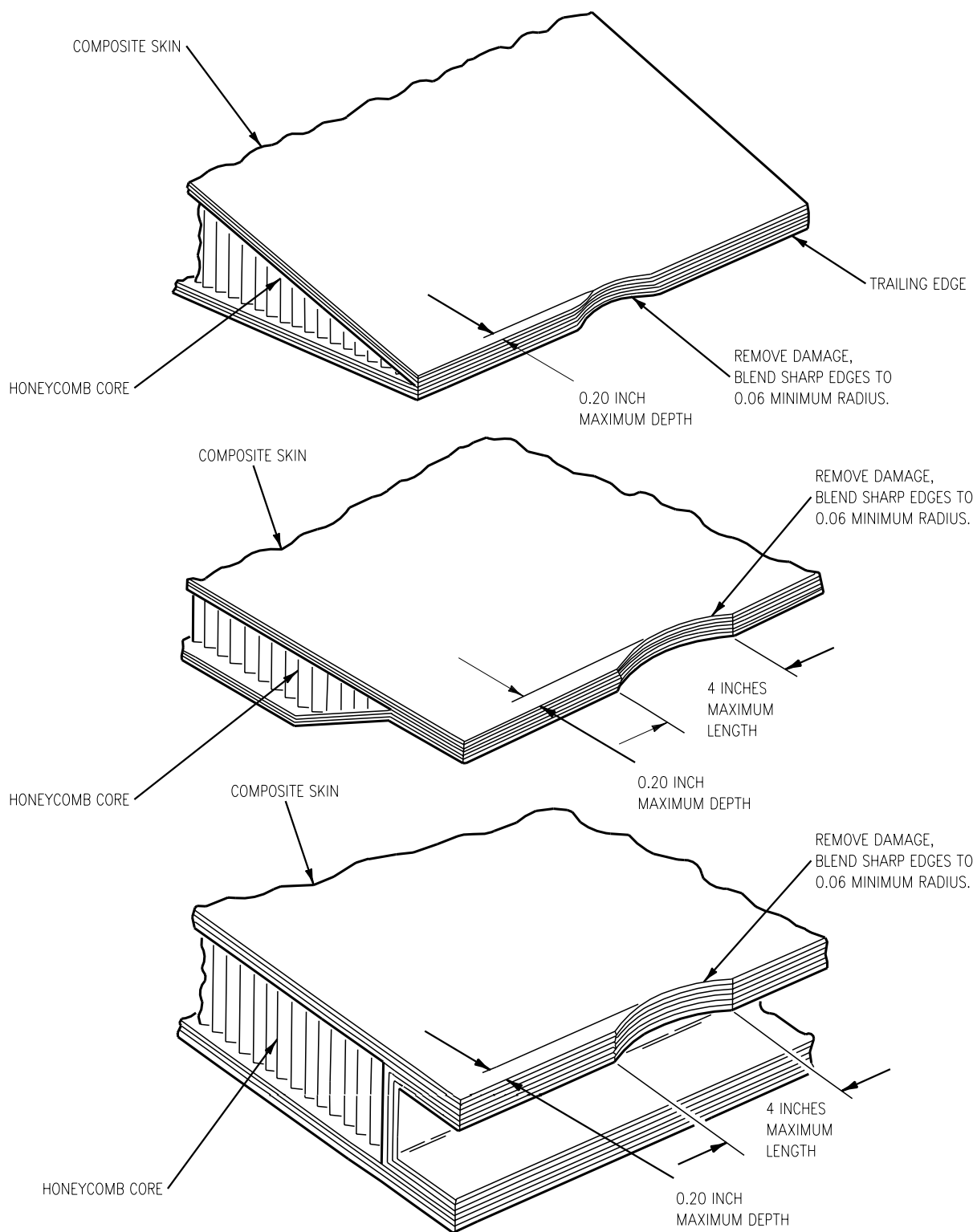
c. Do NDI to make sure damage is removed (A1-F18AC-SRM-300, WP008 01).

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Prepare adhesive (WP003 00).

e. Apply adhesive to edge of repair. Cure adhesive (WP004 00).



**Figure 1. Class IX Damage Repair**





## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS X DAMAGE REPAIR

## Reference Material

Aircraft Corrosion Control.....	A1-F18AC-SRM-500
Finish System.....	WP012 00
Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core.....	WP008 01
Structure Repair, Typical Repair.....	A1-F18AC-SRM-250
Material Preparation.....	WP003 00
Curing of Repairs.....	WP004 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
74D110172-1001	Tool Set - Structural Repair, Composite Materials	200SG40TR	Plastic Sheet
		855-1-000 IN.	Pressure Sensitive Tape
		GG-D-223	Metal Spatula
		Pattern 30	Cloth, Nylon (Scrim Cloth)
		EA9321 A/B	Adhesive
		CCC-C-440, TYPE 1, CLASS 1	Cheesecloth
		A-A-1047, GRIT 180-9X11 240-9X11	Paper, Abrasive

## WARNING

Sanding and cutting of graphite epoxy material produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

- a. Mask around damage area plus 1-1/2 inches with pressure sensitive tape.
- b. Cut out damage. Maintain a minimum radius of 3/8-inch.
- c. If damage extends into honeycomb core, remove loose pieces. Vacuum clean core area.

## CAUTION

To prevent more damage, avoid sanding into base material when removing finish.

- d. Remove finish 1 inch in each direction from damage using 180 grit abrasive paper. Wipe clean with clean dry cheesecloth.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- e. Prepare adhesive (WP003 00).

f. Apply a thin layer of adhesive using a spatula to lower surface of damage. Extend adhesive approximately 3/4-inch past edge of damage.

g. Cut a single layer of nylon cloth to extend approximately 3/4-inch past adhesive and in line with trailing edge.

h. Secure nylon cloth in place with pressure sensitive tape. Keep tape at least 1/4-inch from adhesive. Press nylon cloth into adhesive. If required, add more adhesive to cover cloth.

i. Cut layer of plastic sheet to cover nylon cloth and to extend approximately 1 inch over trailing edge. Crease plastic sheet to form to shape of trailing edge.

j. Secure plastic sheet in place with pressure sensitive tape on lower surface. The plastic sheet which folds onto upper surface will be secured in step m.

k. Fill void with adhesive extending a thin layer approximately 3/4-inch past edge of upper surface. Trowel smooth, leaving excess adhesive above mold line to allow for shrinkage.

l. Cut single layer of nylon cloth for upper surface and secure with pressure sensitive tape per steps g and h.

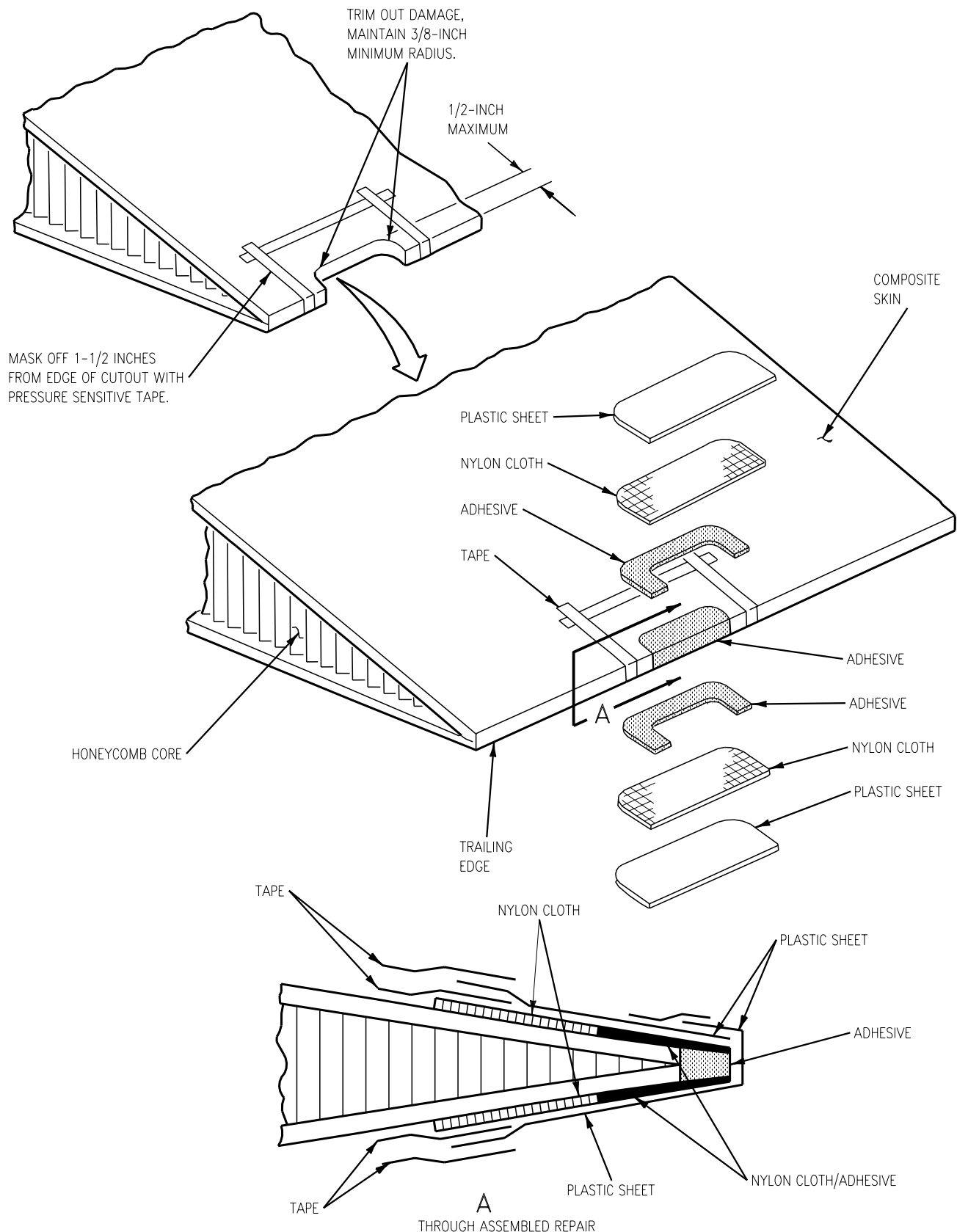
m. Cut layer of plastic sheet to cover nylon cloth. Place plastic sheet over nylon cloth and under plastic sheet folded over from lower surface. Secure plastic sheet in place with pressure sensitive tape.

n. Cure adhesive (WP004 00).

o. After cure, remove plastic sheet, trim excess nylon cloth, and fair edges of repair with mold line using 240 grit abrasive paper.

p. Inspect repair visually and with NDI method to make sure repair is completely filled (A1-F18AC-SRM-300, WP008 01) .

q. Refinish repair area (A1-F18AC-SRM-500, WP012 00).



**Figure 1. Class X Damage Repair**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS XI DAMAGE REPAIR

## Reference Material

Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic through Transmission Contact Testing, Standardization and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core.....	WP008 01
Structure Repair, Typical Repair.....	A1-F18AC-SRM-250
Material Preparation.....	WP003 00
Curing of Repairs.....	WP004 00
Aluminum, Graphite Epoxy, Or Titanium Patch Installation and Removal...	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
74D110172-1001	Tool Set - Structural Repair, Composite Materials	200SG40TR 855-1-000 IN. EA9321 A/B CCC-C-440, TYPE 1, CLASS 1 GG-D-226	Plastic Sheet Pressure Sensitive Tape Adhesive Cheesecloth
0.100 Inch Thick, Steel or Titanium (Size as Required for Patch Installation	Metal Backup Plate	A-A-1047, GRIT 180-9X11 240-9X11	Metal Spatula Paper, Abrasive

## WARNING

Sanding and cutting of graphite epoxy material produces a fine dust that may cause skin irritation. Breathing of an excessive amount of dust may be injurious.

Use caution in the disposal of fibrous graphite and graphite epoxy scrap. Graphite fibers have high electrical conductivity. Free floating fibers that get inside unsealed or unprotected electrical equipment can cause failure or malfunction.

- a. Remove damaged area to a circular configuration.
- b. Remove frayed and damaged honeycomb material from void area. Vacuum clean repair area.
- c. Mask around damaged area with pressure sensitive tape and remove finish 3 inches in each direction from damage using 180 grit abrasive paper.
- d. Vacuum sanding dust from repair area. Wipe surface clean with dry cheesecloth.
- e. Cut a layer of plastic sheet and cover hole on lower side of assembly. Allow 1 inch of plastic sheet to extend over trailing edge. Crease plastic sheet to form to shape of trailing edge.
- f. Tape plastic sheet in place with pressure sensitive tape on lower surface. The plastic sheet which folds onto upper surface will be secured in step k.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- g. Prepare adhesive (WP003 00).

## NOTE

If required, support plastic sheet applied to lower surface with a metal backup plate, taped in place. Fabricate plate per steps below.

h. Fabricate a flat metal backup plate. Make plate the size as required to allow patch installation. Smooth edges of plate using 180 grit abrasive paper.

i. Smooth surface finish using 240 grit abrasive paper. Wipe surface of plate with clean dry cheesecloth.

j. Fill void with adhesive using a spatula. Work adhesive thoroughly into void to avoid air pockets. Trowel smooth, leaving excess adhesive above mold line to allow for shrinkage.

k. Cut a layer of plastic sheet. Place plastic sheet over adhesive and under plastic sheet folded over from lower surface. Secure plastic sheet in place with pressure sensitive tape.

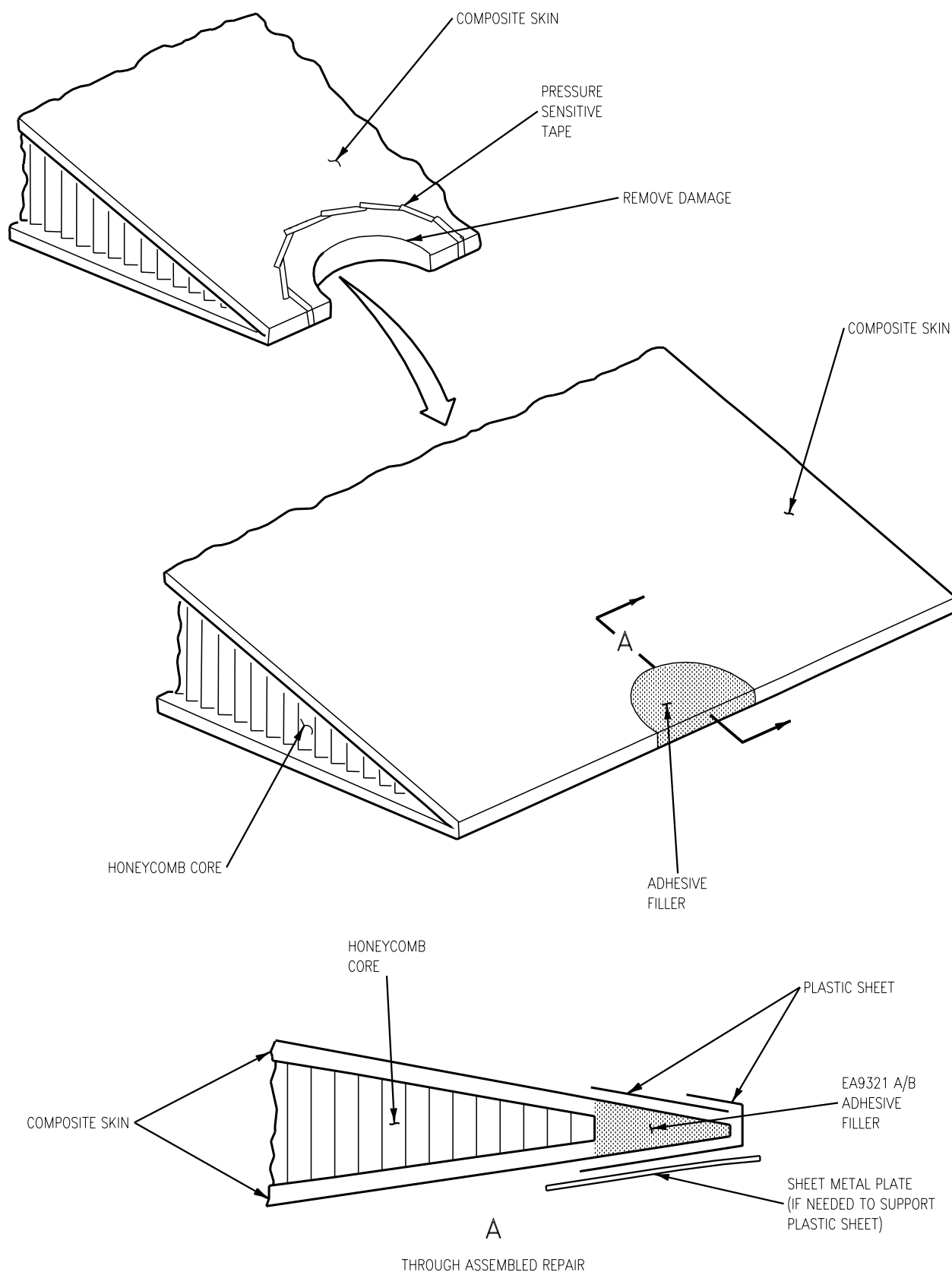
l. Cure adhesive (WP004 00).

m. After cure, remove plastic sheet and tape. Sand repair surface smooth using 240 grit abrasive paper.

n. Inspect repair visually and with NDI to make sure void is completely filled (A1-F18AC-SRM-300, WP008 01).

o. If required by A1-F18AC-SRM-210 through 240 or A1-F18AE-SRM-600 through -750 structure repair manual, install applicable patches (WP007 00).

p. If patch has been installed, do NDI to verify bond line integrity (A1-F18AC-SRM-300, WP008 01).



**Figure 1. Class XI Damage Repair**





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**ORGANIZATIONAL AND INTERMEDIATE MAINTENANCE**
**STRUCTURE REPAIR****TYPICAL REPAIR**
**GRAPHITE EPOXY SKIN AND ALUMINUM HONEYCOMB CORE, CLASS XII OR ALUMINUM SKIN  
AND ALUMINUM HONEYCOMB CORE, CLASSES III, IV, V, AND VII DAMAGE REPAIR**


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**Reference Material**

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Storage, Preparation and Handling Procedures for Structural Adhesives.....	WP 003 00
Heating Equipment Setup and Cure of Structural Adhesives.....	WP 004 00
Water Removal.....	WP 005 00
Router Holder, Adjustable, Part No IED84-232 .....	WP 006 02
Aluminum, Carbon Epoxy and Titanium Patch Installation and Removal .....	WP 007 00
General Composite Repair.....	NAVAIR 01-1A-21

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Damaged Skin and Honeycomb Core Double Sided Repair Using Foaming Adhesive, FM404 or FM410-1, Intermediate Maintenance.....	3

**Record of Applicable Technical Directives**

None

**1. PROCEDURE.**

2. The procedures contained in this work package provide two categories of lightweight repairs for carbon epoxy or aluminum skin and aluminum honeycomb core sandwich structure. See figure 1 for process flow diagram. The categories with type repairs are:

a. Damaged skin surface with honeycomb core damage, Organizational Maintenance Repair (for damage 1.5 diameter or less) and Intermediate

Maintenance Repair (for damage greater than 1.5 diameter) using paste adhesive. (Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Classes III and IV).

b. Damaged skin and honeycomb core repair using foaming adhesive, FM404 or FM410-1, Intermediate Maintenance Repair (Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Class V and VII).

3. **DAMAGED SKIN SURFACE WITH HONEYCOMB CORE DAMAGE REPAIR USING PASTE ADHESIVE, Organization/Intermediate Maintenance.** See figure 2.

### Support Equipment Required

Specification or Part Number	Nomenclature
4SE01754	Cleaner, Vacuum Pneumatic
74D110172-1001	Tool Set - Structural Repair, Composite Materials
10I2081C-01 DOTCO —	90° Router Motor Sanding Disk Holder

### Materials Required

Specification or Part Number	Nomenclature
------------------------------	--------------

#### NOTE

Alternate item specifications or part numbers are shown indented.

0.100 Thick Steel, Aluminum or Titanium (Size as Required for Patch Installation MILC9084TY8CL2	Metal Backup Plate
EA9321 A/B CCCC440TY1CL1 RYMPLE CLOTH- 301-PURIFIED	Cloth, Satin (181 Fiberglass) Paste Adhesive Cloth, Cheesecloth Cloth, Cleaning
D 1153	Methyl Isobutyl Ketone Analyzed Reagent
855 1 IN	Tape, Pressure Sensitive
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive
—	Glass Floc, 0.070± 0.040 Inch Glass Fibers
—	Abrasive Disk, 180 Grit Silicon Carbide

a. Mask around repair area with pressure sensitive tape. Tape should extend 2 inches past edge of area where repair patch is to be installed.

#### WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

b. Wearing clean disposable latex gloves thoroughly solvent degrease the surface using solvent and cheesecloth or rymple cloth (change gloves after 5 minutes or sooner if contaminated). A clean cheesecloth or rymple cloth must be used for each wipe. Continue until cheesecloth or rymple cloth remains clean.

c. Remove paint and primer in masked area per WP 007 00. Vacuum clean area to remove sanding residue and paint residue followed by a dry wipe with cheesecloth or rymple cloth.

#### WARNING

Sanding and cutting of carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount of dust may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Health and Safety.

#### CAUTION

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract particulate away from aircraft and electrical equipment.

d. Remove damaged skin to a circular configuration.

e. Visually inspect core for depth and amount of damage.

f. Remove core down to depth of damage using a router motor, 180 grit sanding disk and sanding disk holder. For sanding disk and sanding disk holder, refer to NAVAIR 01-1A-21, Repair Equipment/Tools, Sanding Disk and Sanding Disk Holder. Leave a cylindrical void the same size as the removed skin. Be careful not to damage core during damage removal. Based on diameter and depth of damage, compute total repair weight per part specific work package requirements. Continue with repair if within weight limits for component, if not use other core repair method.

g. Visually inspect core cavity for presence of fluid. If fluid other than water exist, seek engineering disposition.

h. Vacuum clean repair core cavity and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

i. Cover hole on part surface with perforated plastic sheet and breather cloth and tape in place. Tape metal plate over plastic sheet and breather cloth.

j. Do water removal (if required) and dry part per WP 005 00.

k. Remove plate, breather cloth, and perforated plastic sheet.

l. Cover skin around repair cutout with pressure sensitive tape. Tape should extend 2 inches past cutout.

m. Prepare filler by mixing 14 parts (by weight) chopped glass floc with EA9321 adhesive per WP 003 00.

n. Apply filler into repair cavity in 100-gram increments using a spatula, ensuring that filler penetrates 0.25 inch into open core cells. Avoid trapping air in filler when applying to repair cavity. Wait two hours between applications.

o. When repair cavity is completely filled, add excess filler for any shrinkage.

p. Allow filler to set at room temperature for 8 hours. As an alternate, allow filler to set at room temperature for 2 hours followed by heating with a

heat lamp to 150±10°F for 1 hour. Operate the heat lamp per NAVAIR 01-1A-21.

q. After filler has set, use 180 grit abrasive paper to sand excessive filler.

r. Remove pressure sensitive tape from repaired area and sand filler with 180 to 240 grit abrasive paper. Sand filler flush with skin. Vacuum clean repair area. Wipe surface clean with cheesecloth or rymple cloth.

s. Visually inspect to make sure repair cavity is filled. If repair cavity is filled go to next step. If not filled, repeat steps 3l to 3q and sand flush with part surface using 180 to 240 grit abrasive paper. Wipe surface with clean dry cheesecloth or rymple cloth.

t. Select patch(es) per part specific structural repair manual (A1-F18AC-SRM-210 through -240 or A1-F18AC-SRM-600 through -760).

u. Do preparation of part and/or patch surface for bonding and patch installation per WP 007 00.

#### 4. DAMAGED SKIN AND HONEYCOMB CORE DOUBLE SIDED REPAIR USING FM404 OR FM410-1 FOAMING ADHESIVE, INTERMEDIATE MAINTENANCE. See figure 3.

#### Support Equipment Required

Specification or Part Number	Nomenclature
4SE01754	Hepa Filter Vacuum, Cleaner
74D110172-1001	Tool Set - Structural Repair, Composite Materials
74D110172-2001	Core Slicer
—	Straight Edge
1ED84-232	Router Holder
CJ-814-1	File, Rotary
GGG-S-000278	Shears, Straight
TY1CLIDE2STA	Trimmers
GGG-K-00450	Knife, Craftsman's
TY1ST2ST3ST4	
MW101MD80	Wheel, Abrasive
1012081C-01 DOTCO	0° Router Motor

## Materials Required

## NOTE

Alternate item specifications or part numbers are shown indented.

Specification or Part Number	Nomenclature
135028	Adhesive, Foaming Repair Package Kit, 410-1
135014	Adhesive, Foaming Repair Package Kit, 404
EA9321 A/B 35001-1001, -1003, -1005, -1007, -1009 and -1011 200SG40TR	Paste Adhesive Honeycomb Core Kit
CCCC440TY1CL1 RYMPLE CLOTH- 301-PURIFIED	Plastic Sheet (Release Film) Cloth, Cheesecloth Cloth, Cleaning
D 1153	Methyl Isobutyl Ketone Analyzed Reagent
1.00 Thick, Steel, Aluminum or Titanium (Size as Required for Patch Installation)	Metal Backup Plate
ANSI B74.18 GRIT 180 AL OXIDE	Cloth, Abrasive
ANSI B74.18 GRIT 240 AL OXIDE	Cloth, Abrasive
QQ-A-250	Aluminum Sheet
MIL-G-3866 TYPE 1 E-007	Gloves, Cotton Gloves, Surgeons
TEMP-R-GLAS6TB	Cloth, Coated
MIL-B-121 TYPE 2 GRADE A CLASS 1	Barrier Material (Kraft paper)
855 1 IN	Tape, Pressure Sensitive

a. Mask around repair area on both sides with pressure sensitive tape. Tape should extend 2 inches past edge of area where repair patch is to be installed.

## WARNING

Methyl isobutyl ketone is toxic and has long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid open flames, heat sources and grinding operations.

b. Wearing clean disposable latex gloves thoroughly solvent degrease the surface using solvent and cheesecloth or rymple cloth (change gloves after 5 minutes or sooner if contaminated). A clean cheesecloth or rymple cloth must be used for each wipe. Continue until cheesecloth or cheesecloth or rymple cloth remains clean.

c. Remove paint and primer in masked area per (WP007 00). Vacuum clean area to remove sanding residue and paint residue followed by a dry wipe with cheesecloth or rymple cloth.

## WARNING

Sanding and cutting of carbon epoxy material produces fine dust that may cause skin irritation. Breathing an excessive amount of dust may be harmful. Use the personal protective equipment defined in NAVAIR 01-1A-21, Health and Safety.

## CAUTION

Use caution in disposal of carbon epoxy scrap. Carbon dust is conductive and may cause malfunction of electrical and electronic devices, and may cause corrosion if allowed to settle on metallic components. Contain and extract particulate away from aircraft and electrical equipment.

## NOTE

If damage is to only one skin, procedure below requires cutting through both skins and core, see figure 3.

d. Remove damage to both skins to a circular configuration. Align cut outs through both skins.

e. Using a core slicer, carefully slice down cell walls parallel to the part cell axis. Remove core completely to opposite skin cut out.

f. Visually inspect core cavity for presence of fluid. If fluid other than water exist, seek engineering disposition.

g. Vacuum clean repair core cavity and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

h. Determine part core density and ribbon direction from the part specific structural repair manual (A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -760). Select a replacement core material from table 1 as per parts specific structural repair manual. If a core splice exists in the area being repaired (as indicated by presence of core splice material) select the higher density core section to be the replacement core. Core section is to extend past the outer mold line by 0.05 to 0.10 inch.



Wear clean cotton gloves when handling honeycomb core to prevent contamination.

i. Using a core slicer, cut honeycomb core plug to provide a gap (0.1 inch gap for FM404 foaming adhesive and 0.15 inch gap for FM410-1 foaming adhesive) between the repair cavity and the core plug. Be sure core plug ribbon direction matches part core ribbon direction of the highest density core in the repair area.

j. Insert rough cut core plug in cavity and do water removal (if required) per WP 005 00. With rough cut core plug inserted in cavity, dry part per WP 005 00.

k. Fasten replacement core plug in place using the following substeps:

(1) Fabricate 0.10 thick (for FM404) or 0.15 thick (for FM410-1) by 0.50 wide aluminum spacers to fit around periphery of the replacement core. Apply pressure sensitive tape to surface of spacers. Spacers should be longer than the thickest core plug section.

(2) Install core plug section into part cavity ensuring core plug ribbon direction aligns with part core ribbon direction. Install spacers fabricated in the previous step in core plug to part core gap. Leave 1 inch between spacers. Be sure core plug extends above both outer mold line surfaces.

(3) Make an adhesive putty by preparing a small amount (15-20 grams) of EA9321 adhesive and 30 parts by weight glass floc per WP 003 00.

(4) Apply a small amount of adhesive putty to fasten core plug to part skin surface at the damage cut out hole edge near part surface. (see figure 3, view D) between installed spacers at 1 inch intervals. Be careful not to get putty on spacers.

(5) Allow the adhesive putty to set for 8 hours at room temperature. As an alternate, allow adhesive to set for 2 hours at room temperature followed by a heating with a heat lamp to  $150 \pm 10^{\circ}\text{F}$  for 1 hour. Operate the heat lamp per NAVAIR 01-1A-21.

(6) Remove spacers.

(7) Apply pressure sensitive tape over part skin in repair area as close to protruding core plug as possible. Tape should extend 2 inches past protruding core plug.

l. Machine core flush with outer mold line surface using a 0 degree router motor, a router holder and burr special cutter using the following substeps:

(1) Install burr cutter in the router motor and the router motor in the router holder. For router holder, refer to WP006 02.

(2) Adjust the router motor in the router holder so that the cutting edge of the burr special cutter is flush with the tape on the outer mold line surface of the part.

(3) Using the part surface as a guide, carefully machine core plug flush with the tape on outer mold line surface of part. Start by machining around core periphery. Be careful during machining not to cut into the part skin or to undercut core.

(4) Remove tape on outer mold line surface of part and lightly finish sand core on outer mold line surface of part using 180-240 grit abrasive paper and a sanding block.



(5) Using a straight edge that extends past the machined core and on the part surface, Be sure that the surface of the machined core plug is flush with the outer mold line. If the core plug is higher than the part surface, locally finish sand core flush with outer mold line surface of part then go to step n. If core plug is lower than outer mold line, remove core plug per step m and repeat steps h to l.

m. Very carefully cut away adhesive using a router motor and a diamond cutting wheel. Be careful during adhesive removal not to damage part skin, part core or replacement core. Remove core from cavity.

n. Vacuum clean repair core cavity and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

## WARNING

Methyl isobutyl ketone is toxic and have long term harmful effects. When using these materials wear skin, eye and respiratory protection. Avoid repeated or prolonged contact. Avoid all open flames, heat sources and grinding operations.

o. Flush core plug with methyl isobutyl ketone to remove any contaminants and allow to dry. Cover with clean kraft paper.

## NOTE

FM410-1 is the preferred foaming adhesive material.

p. Remove kit of foaming adhesive FM404 or FM410-1 from frozen storage, Be sure adhesive shelf life has not expired and allow adhesive to get to room temperature per WP 003 00 for a minimum of 2 hours before opening sealed bag.

## NOTE

FM404 adhesive has a very narrow temperature band for handling. The material is most workable at 40°F. The material may be momentarily installed in the freezer to get the temperature into a workable range.

q. Open sealed bag of foaming adhesive and remove sheet. Do not remove backing paper.

r. Using scissors or an x-acto knife, cut adhesive to cover part core side walls. Two layers are to be applied.

s. Remove release paper from one side of cut adhesive pieces. Press the exposed adhesive on the part core side walls in the repair cavity (see figure 3, view F). Remove remaining release paper. Repeat this process for the second layer of adhesive.

t. Carefully install replacement core into repair cavity. Be sure core ribbon direction is aligned with part core ribbon direction. To aid core installation when using foaming adhesive, position 1 inch wide strips of Teflon cloth cut 3 inches longer than the maximum thickness of the core plug on foaming adhesive before core installation. Remove strips after core plug is installed. Visually inspect installation to verify that adhesive was not wiped off walls during core installation.

u. Cover hole on upper and lower surface with plastic sheet and tape in place. Position a metal plate over plastic sheet on lower surface and tape in place.

**CAUTION**

Use only positive pressure when expanding FM404 foaming adhesive. DO NOT use vacuum pressure or overexpansion and significantly reduced strength will result.

FM410-1 foaming adhesive may be cured with or without vacuum per WP 004 00.

100 % contact must be maintained between heat blanket and part to prevent heat damage to part.

**NOTE**

Foaming adhesive will expand during heat cycle to fill gap between core plug and part.

Final cure of foaming adhesive will be done during cure of external patch bond film adhesive.

v. Partly cure foaming adhesive using positive pressure and a heat blanket applied to both sides of part per WP 004 00.

w. Remove plastic sheet and metal plate.

x. Visually inspect the core side wall bond to make sure adhesive has properly expanded and that no gaps exist. If large voids exist, reapply foaming adhesive in void areas and repeat the previous step. EA9321 paste adhesive may be applied to small shallow voids only as follows:

(1) Prepare EA9321 adhesive per WP 003 00.

(2) Apply EA9321 to shallow void areas. When voids are completely filled, add excess to allow for shrinkage.

(3) Allow adhesive to set at room temperature for 8 hours. As an alternate, allow

adhesive to set at room temperature for 2 hours followed by heating with a heat lamp to  $150\pm 10^{\circ}\text{F}$  for 1 hour. Operate the heat lamp per NAVAIR 01-1A-21.

(4) Remove pressure sensitive tape from repaired area and sand adhesive with 180 to 240 grit abrasive paper. Sand adhesive flush with skin. Vacuum clean repair area. Wipe surface clean with cheesecloth or rymple cloth.

y. Remove any residual foaming adhesive on the surface by hand sanding with 180-240 grit abrasive paper and a sanding block. Vacuum clean core plug and repair area. Wipe skin surface clean with clean dry cheesecloth or rymple cloth.

z. Cover exposed core areas with clean kraft paper and tape in place.

aa. Select patches per part specific structural repair manual (A1-F18AC-SRM-210 through -240 or A1-F18AC-SRM-600 through -760).

**CAUTION**

Use caution during aluminum or titanium part surface preparation procedures per WP 007 00 not to allow any liquids to contact foaming adhesive material or damage to part may result.

**NOTE**

Final cure of foaming adhesive will be done during cure of external patch bond film adhesive.

Film adhesive shall be used for external patch bond to make sure a light weight repair is achieved.

ab. Do preparation of part and/or patch surface for bonding and patch installation per WP 007 00.



TABLE 1. HONEYCOMB CORE KIT

PART NO. 13501	CORE DENSITY	LENGTH	WIDTH	THICKNESS
-1001	1/8 CELL X 0.0015	9 INCH	9 INCH	2 INCH
-1003	1/8 CELL X 0.0015	9 INCH	9 INCH	4 INCH
-1005	1/8 CELL X 0.0015	9 INCH	9 INCH	6 INCH
-1007	3/16 CELL X 0.001	12 INCH	12 INCH	2 INCH
-1009	3/16 CELL X 0.001	12 INCH	12 INCH	4 INCH
-1011	3/16 CELL X 0.001	12 INCH	12 INCH	6 INCH

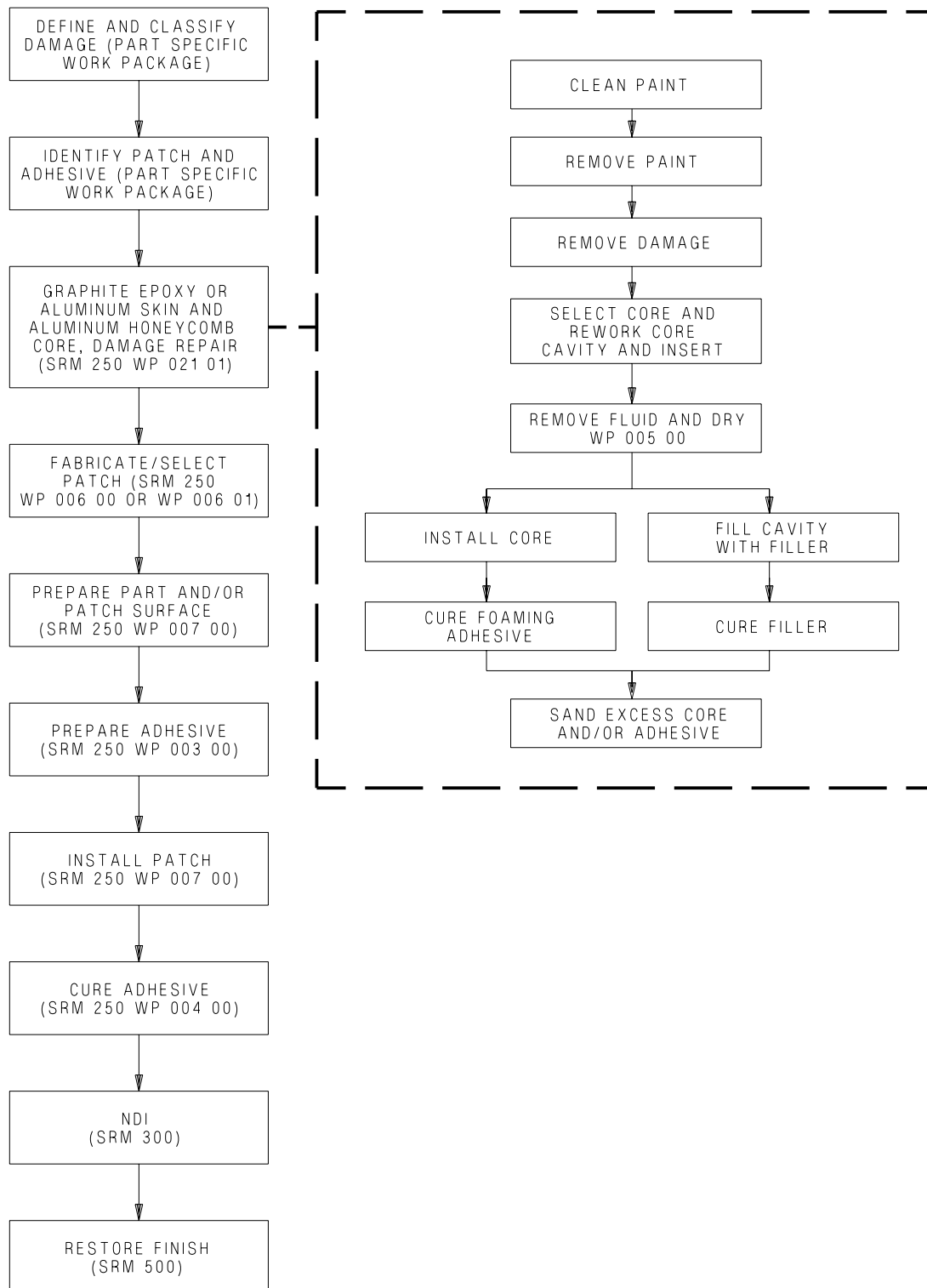
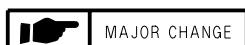
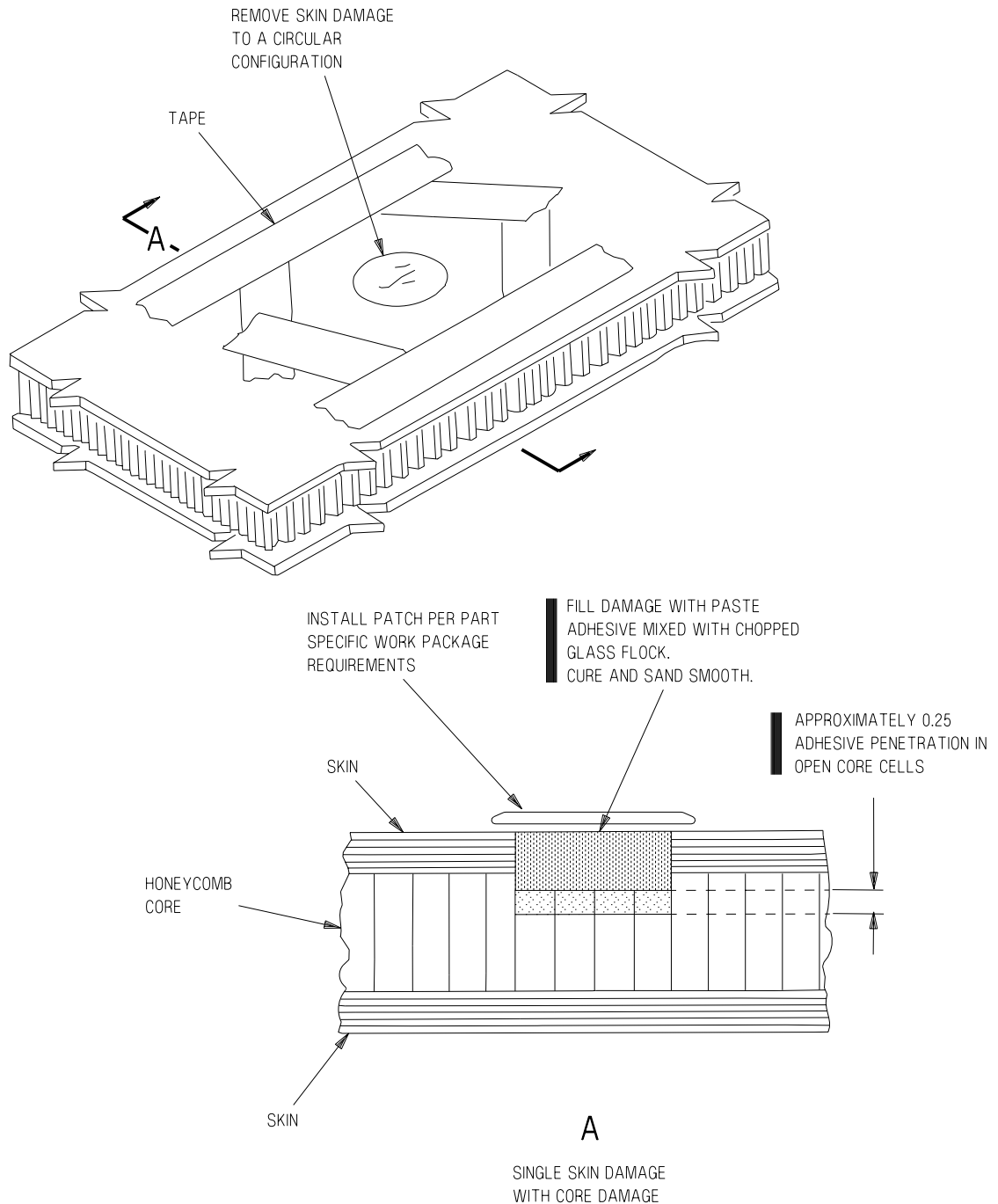


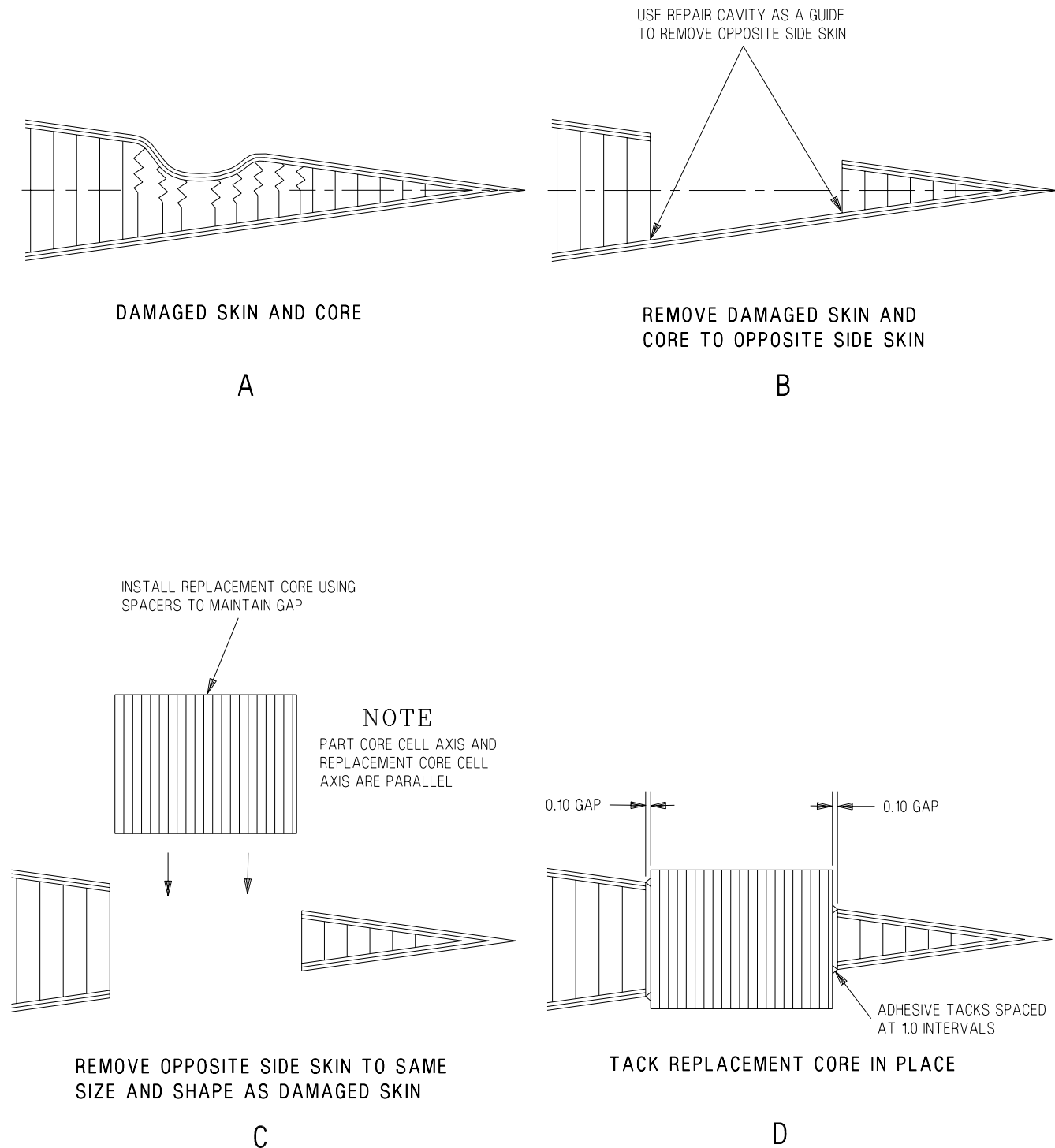
Figure 1. Process Flow



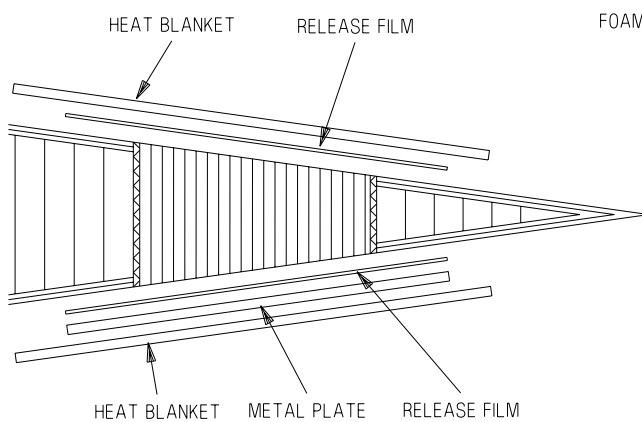
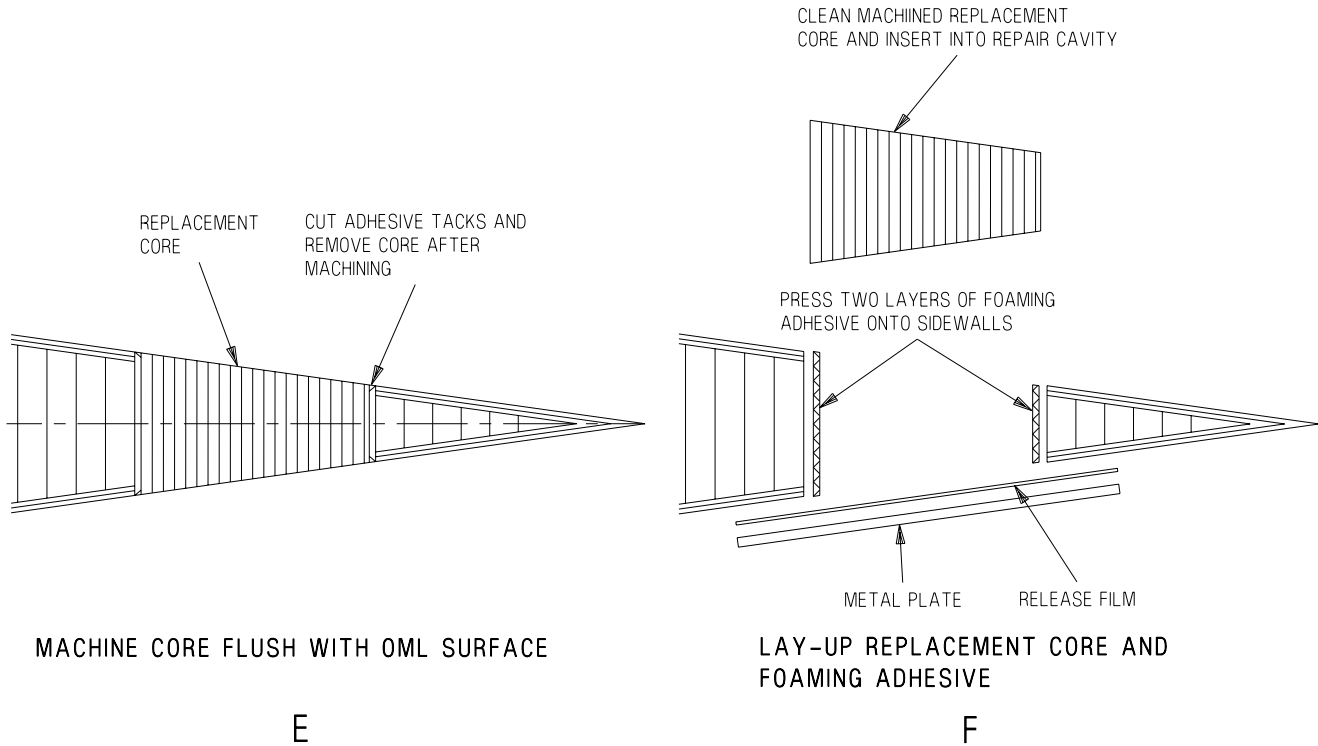
MAJOR CHANGE

ADA790-69-1-039

**Figure 2. Damaged Skin Surface With Honeycomb Core Damage Repair Using Paste Adhesive**



**Figure 3. Damaged Skin and Core Using Foaming Adhesive (Sheet 1)**

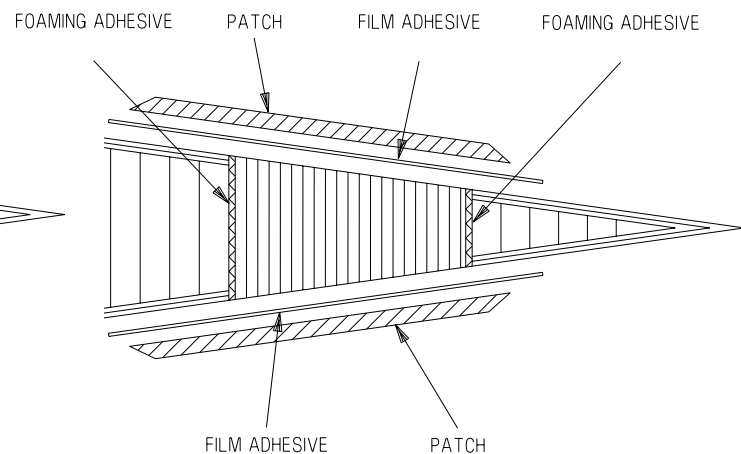


## NOTE

DO NOT USE VACUUM TO APPLY HEAT BLANKET

EXPAND FOAMING ADHESIVE USING HEAT BLANKET AND POSITIVE PRESSURE

G



INSTALL PATCH(ES) PER PART SPECIFIC WORK PACKAGE

H

**Figure 3. Damaged Skin and Core Using Foaming Adhesive (Sheet 2)**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB CORE, CLASS I DAMAGE REPAIR

## Reference Material

Nondestructive Inspection Methods .....	NAVAIR 01-1A-16
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Aluminum, Graphite Epoxy, or Titanium Patch Installation and Removal....	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required (Continued)

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
538A	Air Regulator Assembly, with Oil-Water Separator and Gage	855-1-000IN. A-A-1047, GRIT 240-9X11 420 250-CP2-1/2 — GG-N-196, Number 15	Pressure Sensitive Tape Paper, Abrasive Sealant Gun Nozzles Sealant Cartridges 1/2-Inch ID Rubber or Plastic Tubing Hypodermic Needle
Materials Required			
Specification or Part Number	Nomenclature		
EA956 A/B CCC-C-440, TYPE 1, CLASS 1	Adhesive Cheesecloth		a. Drill 1/8-inch diameter hole through skin into each end of unbond or void. If more than two holes are required use minimum spacing of 1-1/2 inches.

b. Remove any burrs or chips from holes.

c. Make sure holes are located within unbond or void area per steps below.

(1) Fit sealing nozzles into holes at each end of void or unbond. Tape over intermediate holes with pressure sensitive tape.

(2) Attach piece of tubing to one nozzle and submerge other end in container of water.

(3) Attach other nozzle to sealant gun cartridge without plunger and place cartridge in sealant gun. Attach a regulated source of compressed air to sealant gun.

(4) Apply pressure with air regulator set for 40 psi through sealant gun into void or unbond.

(5) Check water for bubbles to make sure air flow exists. If air flow exists, go to step d. If air flow does not exist, do steps c(6) and c(7).

(6) Do NDI to locate unbond or void area (NAVAIR 01-1A-16).

(7) Repeat steps a and c(1) through c(5).

d. Remove nozzle from holes.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

e. Prepare adhesive (WP003 00).

f. Attach hypodermic needle to sealant gun nozzle by trimming nozzle until needle fits tightly.

g. Attach a regulated source of compressed air to sealant gun. Set air regulator for 40 psi and inject adhesive into one hole and fill until adhesive flows clear from holes.

h. Wipe off excess adhesive with clean dry cheesecloth and cover holes with tape.

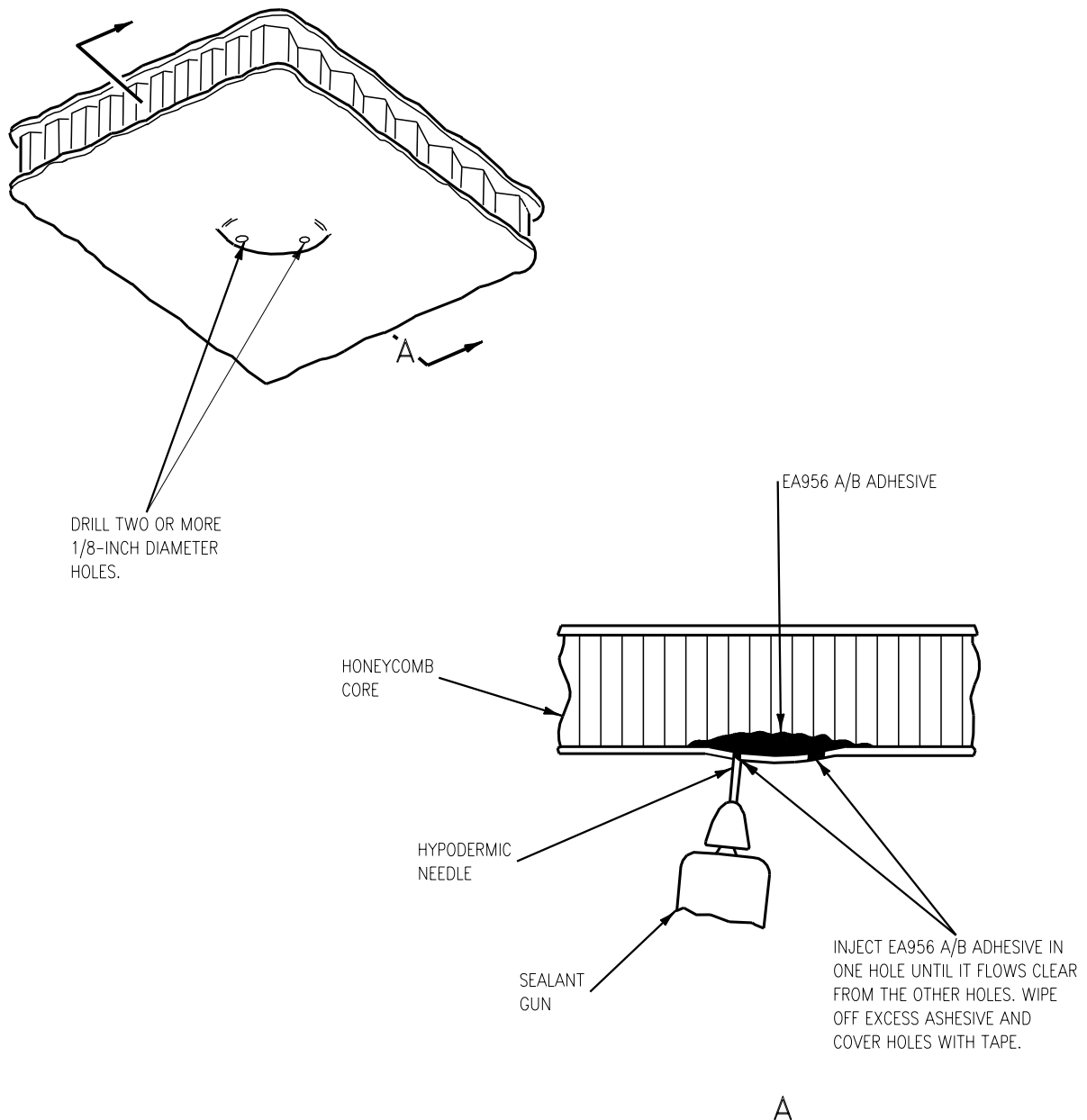
i. Cure repair (WP004 00).

j. After cure, remove tape and sand surface smooth using abrasive paper.

k. Do NDI to make sure unbond or void area is completely filled (NAVAIR 01-1A-16). If unbond or void is filled, go to step l. If unbond or void area is not filled, reclassify damage per applicable structure repair manual.

l. If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual, install applicable patches (WP007 00).

m. If patch has been installed, do NDI to verify bond line integrity (NAVAIR 01-1A-16).



**Figure 1. Class 1 Damage Repair**





## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB CORE, CLASS II DAMAGE REPAIR

This WP supersedes WP023 00, dated 1 January 1995.

## Reference Material

Nondestructive Inspection Methods .....	NAVAIR 01-1A-16
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Aluminum, Graphite Epoxy, or Titanium Patch Installation and Removal....	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required (Continued)

## Support Equipment Required

None

## NOTE

Alternate item part numbers are shown indented.

## Materials Required

## NOTE

Alternate item part numbers are shown indented.

Specification  
or Part Number

## Nomenclature

EA9321 A/B  
855-1.000IN.

Adhesive  
Pressure Sensitive Tape

Specification  
or Part Number

## Nomenclature

A-A-1047 GRIT  
180-9X11  
240-9X11  
200SG40TR  
GG-D-226  
DS-108F  
5772 048  
CCC-C-440 TYPE 1  
CLASS 1

Paper, Abrasive  
  
Plastic Sheet  
Metal Spatula  
Solvent, Wipe  
Cleaning Compound  
Cheesecloth

a. Mask 1/2-inch past edge of repair area using pressure sensitive tape.

## WARNING

Solvent should be used with care. Gloves must be worn to prevent injury.

Cleaning compound may cause skin irritation. Avoid contact with skin and clothing. Wash thoroughly after handling.

b. Clean unmasked area using clean cheesecloth moistened with solvent or cleaning compound. Allow to air dry 15 minutes.

c. Remove paint from repair area by sanding with 180 grit abrasive paper.

d. Wipe repair area with clean dry cheesecloth.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

e. Prepare adhesive (WP003 00).

f. Fill dent with adhesive using a spatula. Trowel level with mold line.

g. Cover repair with plastic sheet and smooth out wrinkles.

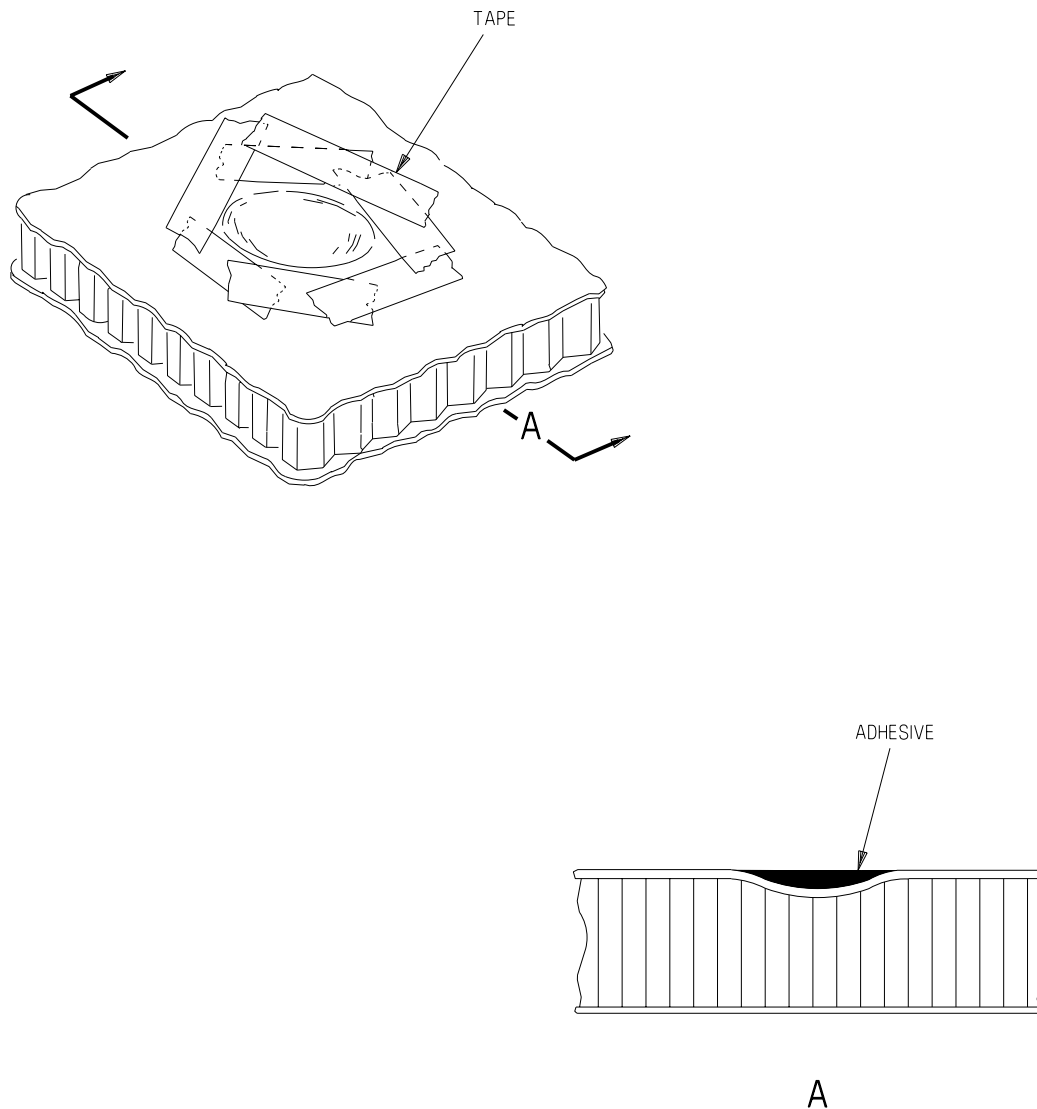
h. Cure repair (WP004 00),

i. After cure, remove tape and sand repair smooth and flush with mold line using 240 grit abrasive paper.

j. Do NDI to make sure void is completely filled (NAVAIR 01-1A-16). If void is filled, go to step k. If void is not filled, reclassify damage per applicable structure repair manual.

k. If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual, install applicable patches (WP007 00).

l. If patch has been installed do NDI to verify bond line integrity (NAVAIR 01-1A-16).



**Figure 1. Class II Damage Repair**



## ORGANIZATIONAL MAINTENANCE

### STRUCTURE REPAIR

#### TYPICAL REPAIR

### ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB CORE, CLASS III DAMAGE REPAIR

This WP supersedes WP024 00, dated 1 August 1997.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Classes III, IV, V, and VII Damage Repair .....	WP 021 01

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## Record of Applicable Technical Directives

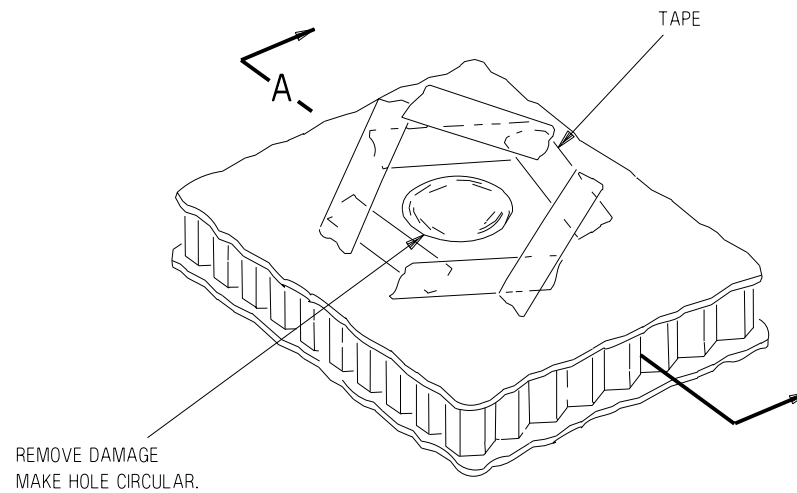
None

### 1. PROCEDURE.

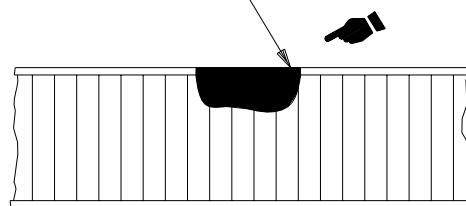
2. For aluminum skin, Class III damage repair is shown in figure 1. For damaged skin surface with honeycomb core damage, organizational

maintenance, detail repair instructions  
(WP 021 01)

3. For titanium skin, Class III damage repair, engineering disposition is required.



FILL HOLE WITH ADHESIVE  
WITH CHOPPED GLASS FLOCK  
CURE AND SAND SMOOTH



A

**Figure 1. Class III Damage Repair**

---

**ORGANIZATIONAL MAINTENANCE****STRUCTURE REPAIR****TYPICAL REPAIR****ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB  
CORE, CLASS IV DAMAGE REPAIR**

This WP supersedes WP025 00, dated 1 August 1997.

---

**Reference Material**

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Classes III, IV, V, and VII Damage Repair .....	WP 021 01

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**Record of Applicable Technical Directives**

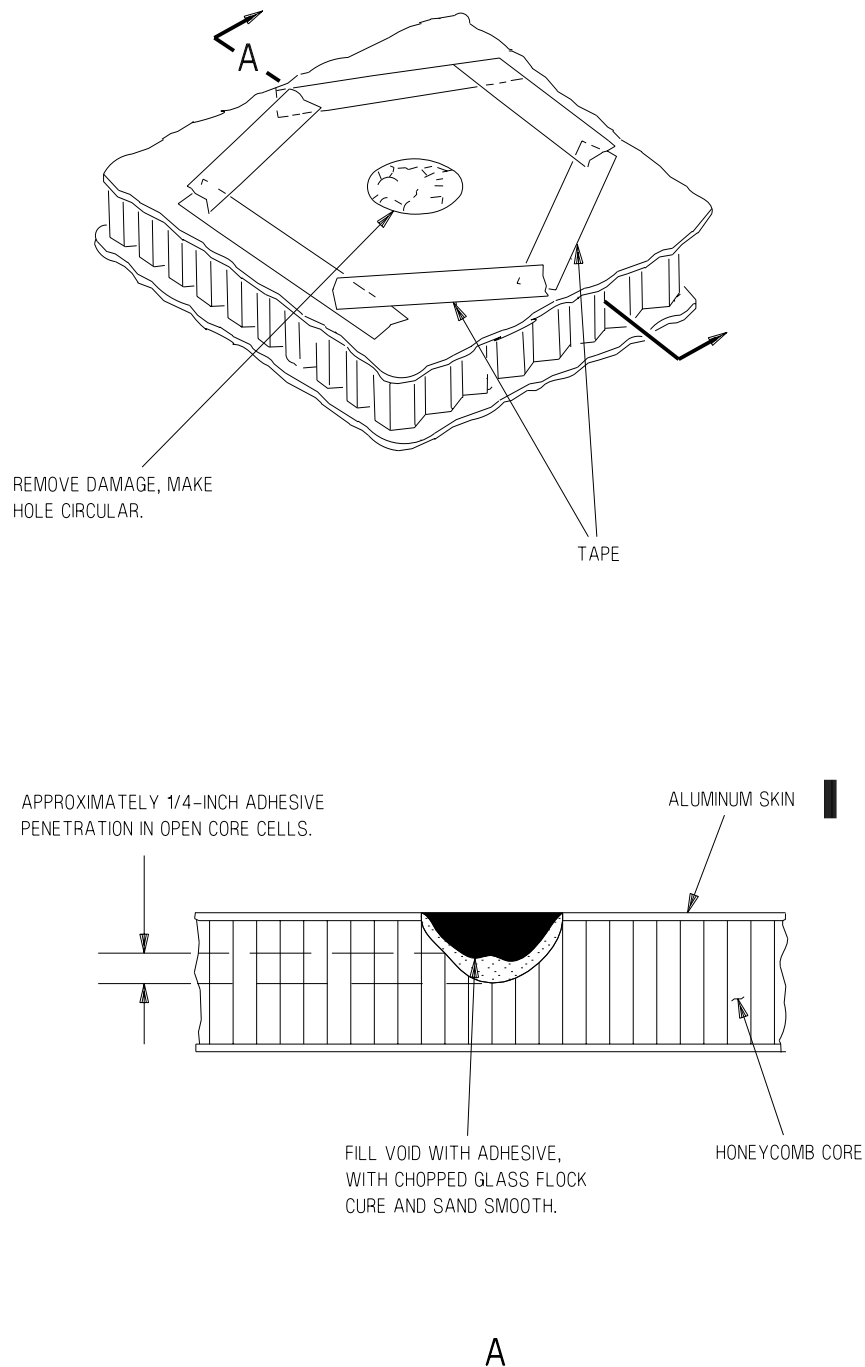
None

**1. PROCEDURE.**

2. For aluminum skin, Class IV damage repair is shown in figure 1. For damaged skin surface with honeycomb core damage, organizational maintenance, detail repair instructions (WP 021 01).

3. For titanium skin, Class IV damage repair, engineering disposition is required.





**Figure 1. Class IV Damage Repair**

## INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB  
CORE, CLASS V DAMAGE REPAIR

This WP supersedes WP026 00, dated 1 June 2000.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Classes V, VI, or VII Damage Repair .....	WP 018 00
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Classes III, IV, V, and VII Damage Repair .....	WP 021 01

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Repair of Aluminum Skin Using FM404 or FM410-1 Foaming Adhesive .....	1
Repair of Titanium Skin .....	1

## Record of Applicable Technical Directives

None

**1. REPAIR OF ALUMINUM SKIN USING  
EA9321 A/B PASTE ADHESIVE.**

2. For aluminum skin, Class V damage repair is shown in figure 1, sheet 1. For damage over 1.5 inch diameter, intermediate maintenance, detail repair instructions (WP 018 00).

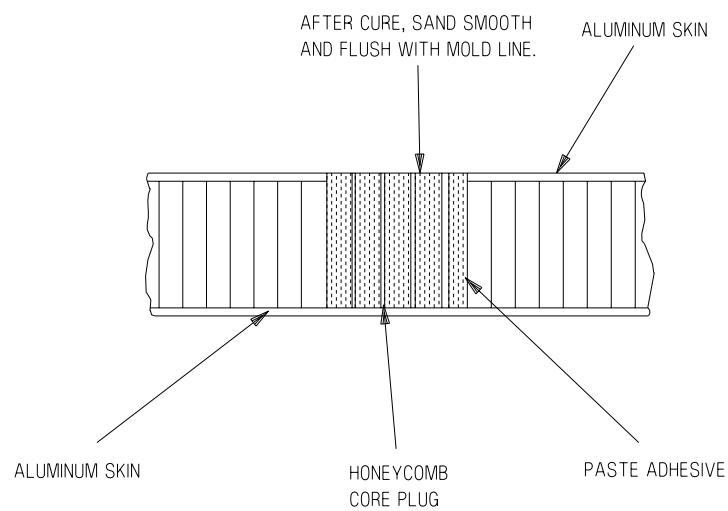
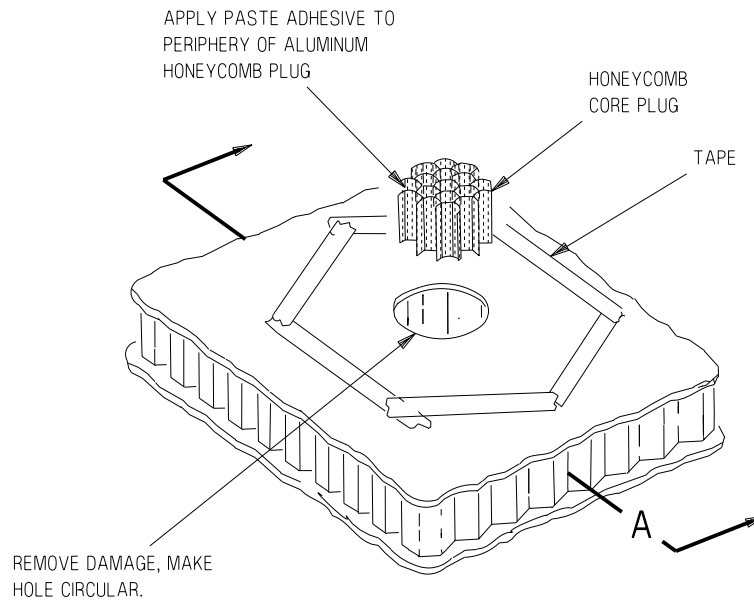
**3. REPAIR OF ALUMINUM SKIN USING  
FM404 OR FM410-1 FOAMING ADHESIVE.**

4. For aluminum skin, Class V damage repair is shown in figure 1, sheet 2. For damage over 1.5 inch

diameter, intermediate maintenance, detail repair instructions (WP 021 01).

**5. REPAIR OF TITANIUM SKIN.**

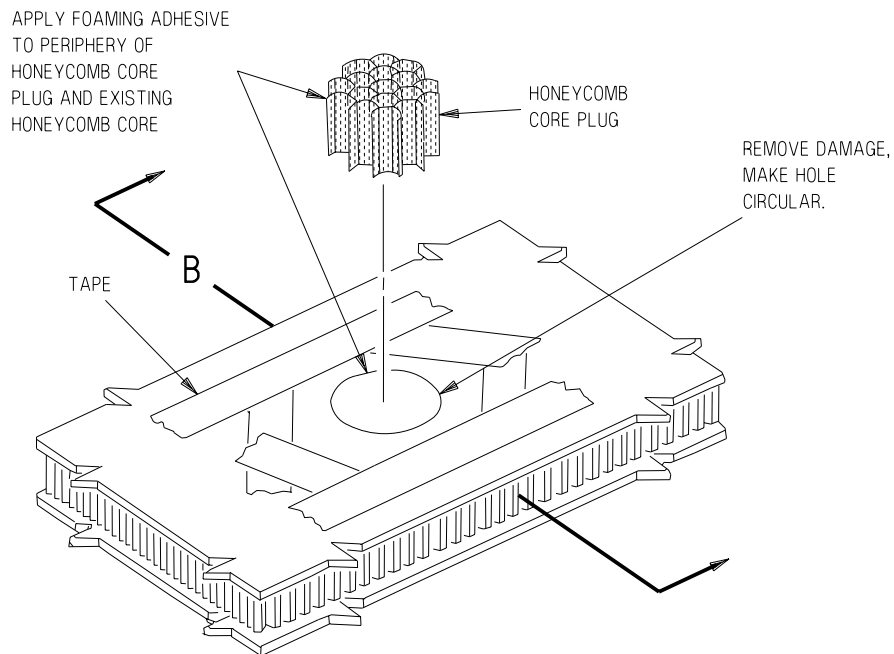
6. For titanium skin, Class V damage repair, engineering disposition is required.



A

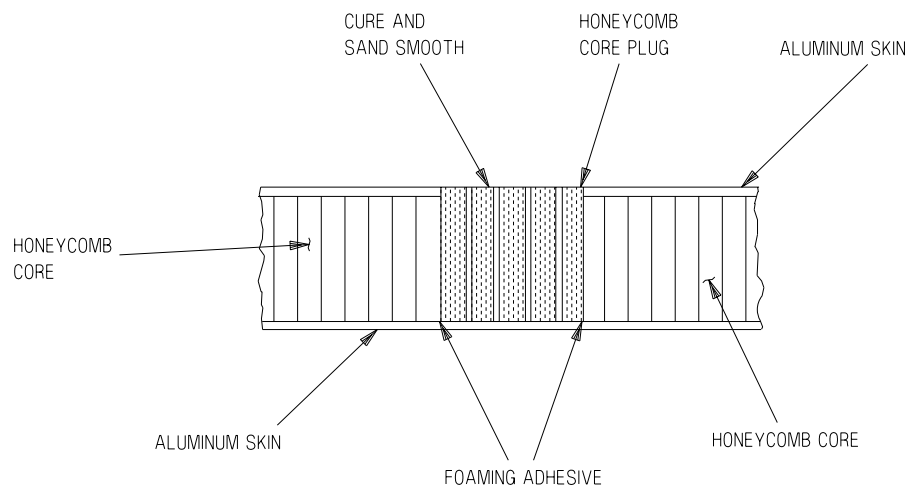
DAMAGED SKIN AND HONEYCOMB CORE  
REPLACEMENT REPAIR USING PASTE ADHESIVE

**Figure 1. Class V Damage Repair (Sheet 1)**



## NOTE

ORIGINAL CLASS V DAMAGE REPAIR SHOWN HAS BEEN SUPERSEDED BY WP021 01.



## B

DAMAGED SKIN AND HONEYCOMB CORE REPLACEMENT REPAIR USING FOAMING ADHESIVE.

Figure 1. Class V Damage Repair (Sheet 2)



## ORGANIZATIONAL MAINTENANCE

### STRUCTURE REPAIR

#### TYPICAL REPAIR

### ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB CORE, CLASS VI DAMAGE REPAIR

This WP supersedes WP027 00, dated 1 August 1997.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Classes V, VI, or VII Damage Repair .....	WP 018 00

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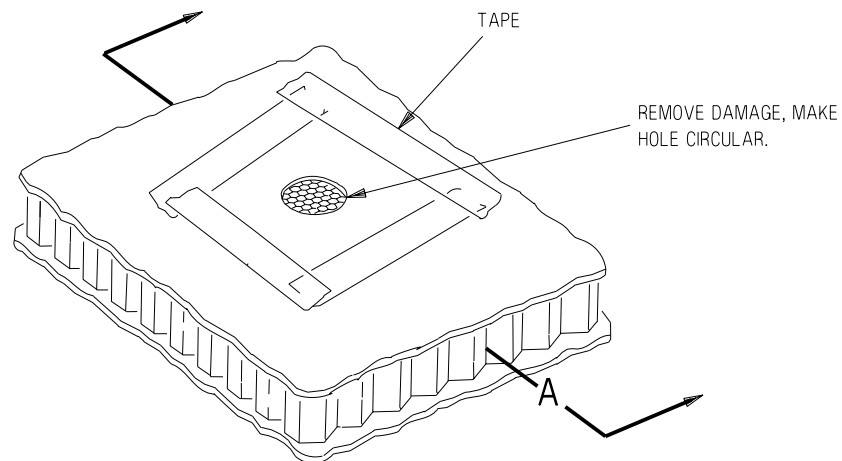
## Record of Applicable Technical Directives

None

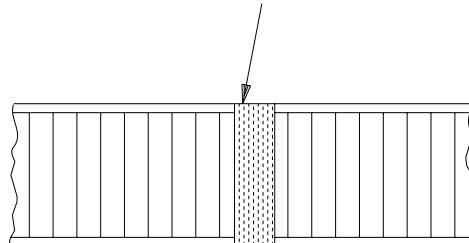
### 1. PROCEDURE.

2. For aluminum skin, Class VI damage repair is shown in figure 1. For damage 1.5 inch diameter or less, organizational maintenance, detail repair instructions (WP 018 00).

3. For titanium skin, Class VI damage repair, engineering disposition is required.



FILL HOLE WITH  
ADHESIVE AFTER  
CURE, SAND UPPER  
AND LOWER SURFACES  
SMOOTH AND FLUSH  
WITH MOLD LINE.



A

**Figure 1. Class VI Damage Repair**

**INTERMEDIATE MAINTENANCE****STRUCTURE REPAIR****TYPICAL REPAIR****ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB  
CORE, CLASS VII DAMAGE REPAIR**

This WP supersedes WP028 00, dated 1 June 2000.

**Reference Material**

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Graphite Epoxy Skin and Aluminum Honey Core, Class VII or Aluminum Skin and Aluminum Honeycomb Core, Classes V, VI, or VII Damage Repair.....	WP 018 00
Graphite Epoxy Skin and Aluminum Honeycomb Core, Class XII or Aluminum Skin and Aluminum Honeycomb Core, Classes III, IV, V, and VII Damage Repair .....	WP 021 01

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Repair of Titanium Skin.....	1

**Record of Applicable Technical Directives**

None

**1. REPAIR OF ALUMINUM SKIN USING  
EA9321 A/B PASTE ADHESIVE.**

2. Aluminum skin, Class VII damage repair is shown in figure 1, sheet 1. For damage over 1.5 inch diameter, intermediate maintenance, detail repair instructions (WP 018 00).

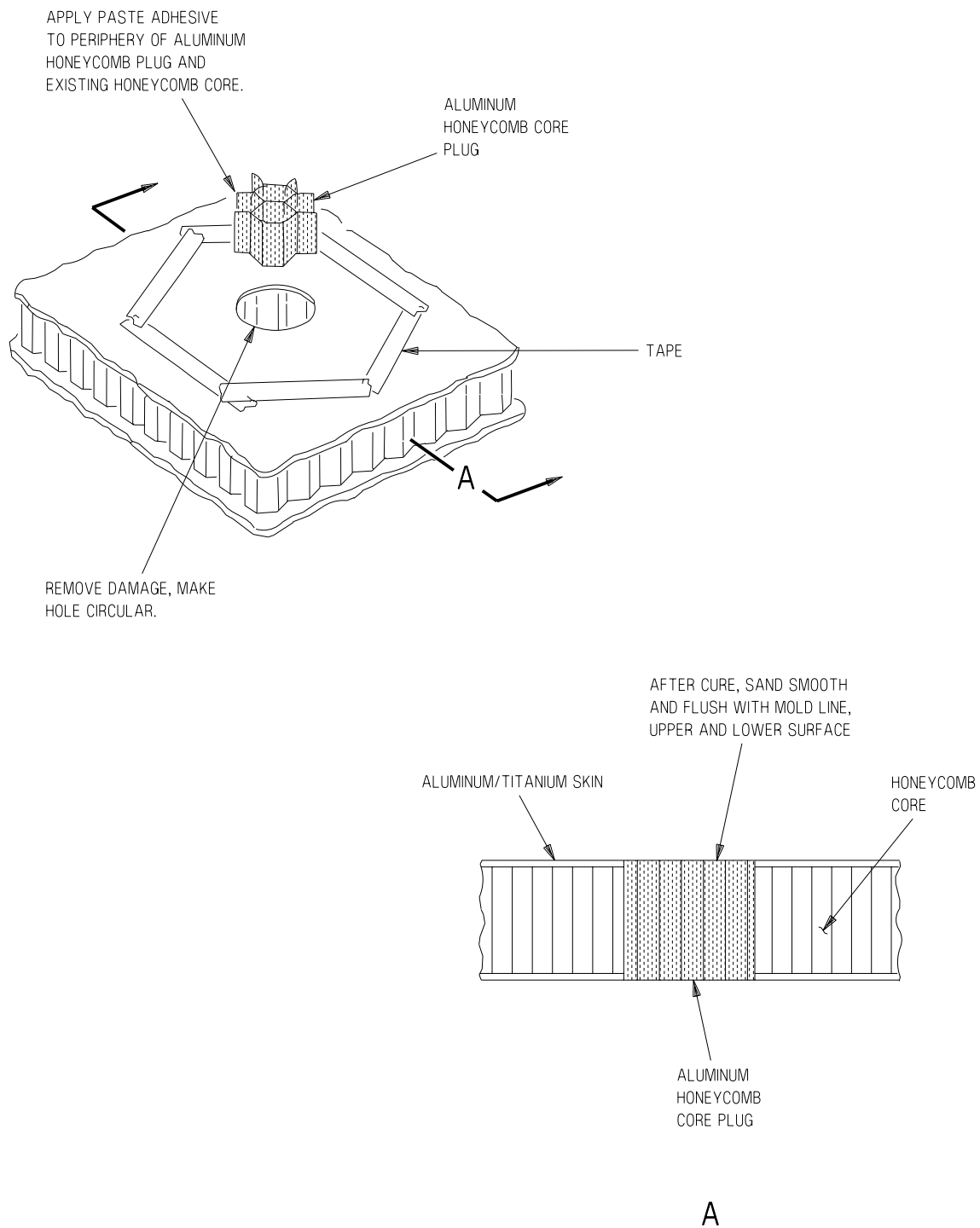
**3. REPAIR OF ALUMINUM SKIN USING  
FM404 OR FM410-1 FOAMING ADHESIVE.**

4. Aluminum skin, Class VII damage repair is shown in figure 1, sheet 2. For damage over 1.5 inch diameter, intermediate maintenance, detail repair instructions (WP 021 01).

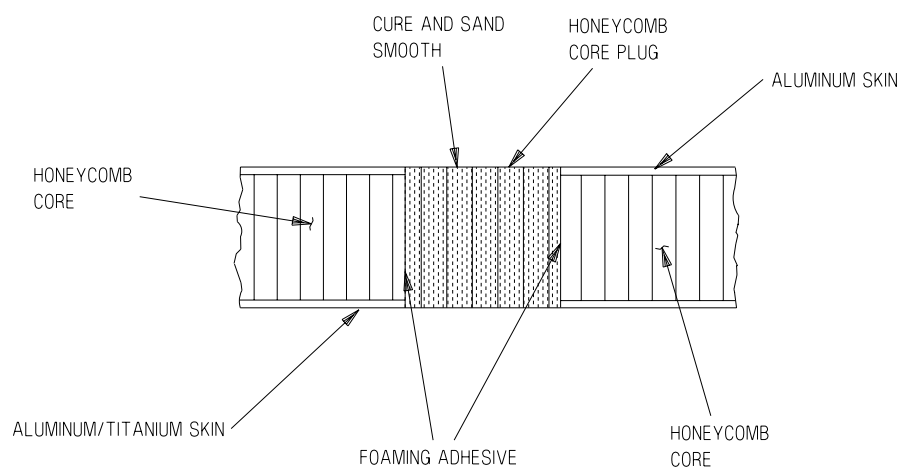
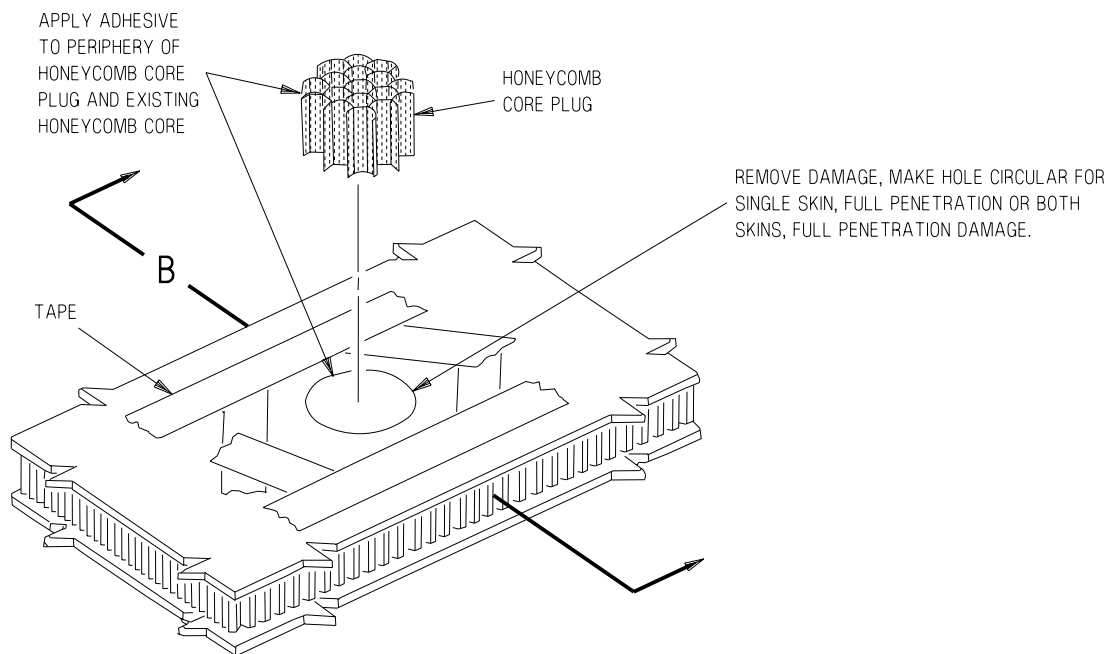
**5. REPAIR OF TITANIUM SKIN.**

6. For titanium skin, Class VII damage repair, engineering disposition is required.





**Figure 1. Class VII Damage Repair (Sheet 1)**



B

Figure 1. Class VII Damage Repair (Sheet 2)



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB CORE, CLASS VIII DAMAGE REPAIR

## Reference Material

Nondestructive Inspection Methods .....	NAVAIR 01-1A-16
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Aluminum, Graphite Epoxy, or Titanium Patch Installation and Removal....	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required (Continued)

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
538A	Air Regulator Assembly, with Oil-Water Separator and Gage	A-A-1047 GRIT 180-9X11, 240-9X11 GG-D-226 250-CP2-1/2 420 200SG40TR GG-N-196	Abrasive Paper  Metal Spatula Sealing Gun Cartridge Sealing Gun Nozzle Plastic Sheet Hypodermic Syringe, Number 15
Materials Required			
Specification or Part Number	Nomenclature		
EA956 A/B CCC-C-440, TYPE 1, CLASS 1 855-1.000IN.	Adhesive Cheesecloth Pressure Sensitive Tape	231849  231850	Semco Needle, SEM- Needle, SEM 18-1/2 Pink Semco Needle, SEM- Needle, SEM 18-1 Pink

a. Isolated Void:

(1) Drill minimum of two 0.125 inch diameter holes, one at each end of void. If more holes are needed, minimum spacing of 1-1/2 inches is required. Make sure holes are located within void area.



Semco-needle must fill hole completely to be able to fill void with adhesive. Use pressure sensitive tape to seal around Semco-needle.

(2) Fit sealing nozzle or semco needle into hole at either end of void or unbond.

(3) Tape over intermediate holes with pressure sensitive tape.

(4) Attach piece of tubing to one sealing gun nozzle and submerge other end into container of water.

(5) Attach another nozzle to sealing gun cartridge without plunger and place cartridge in sealant gun.

(6) Attach regulated source of compressed air to sealant gun.

(7) Apply pressure with air regulator set for 40 psi through sealant gun into void or unbond.

(8) Check water for bubbles to make sure air flow exists. If air flow exists, go to substep (11). If air flow does not exist, do substeps (9) and (10).

(9) Do NDI to locate void (NAVAIR 01-1A-16).

(10) Repeat substeps a(1) through a(8).

(11) Remove nozzle or Semco needle from hole(s).

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

(12) Prepare adhesive (WP003 00).

(13) Inject adhesive at 40 psi into one hole until adhesive flows out other hole or separation. Continue this procedure until adhesive flows clear.

(14) Wipe off excess adhesive with clean dry cheesecloth.

(15) Cover repair with plastic sheet.

(16) Tape plastic sheet in place with pressure sensitive tape.

(17) Cure repair (WP004 00).

(18) After cure, remove tape and plastic sheet.

(19) Sand surface smooth using 180 grit abrasive paper. Finish sanding surface smooth using 240 grit abrasive paper.

(20) Do NDI to make sure repair is complete (NAVAIR 01-1A-16).

(21) If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manuals, install applicable patches (WP007 00).

(22) If patch has been installed, do NDI to verify bond line integrity (NAVAIR 01-1A-16).

b. Edge Separation and unbonds open to Edge:

(1) Drill 0.125 inch diameter hole in void far from edge of separation or unbond as possible.

(2) Tape separated edge, leaving small opening at each end.

(3) Position assembly, where possible, so drilled holes are down and level.

(4) Attach hypodermic syringe to sealant gun nozzle by trimming nozzle until needle fits tightly.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

(5) Prepare adhesive (WP003 00).

(6) Inject adhesive at 40 psi into one hole until adhesive flows out other hole or separation. Continue this procedure until adhesive flows clear.

(7) Wipe off excess adhesive with clean dry cheesecloth.

(8) Cover repair with plastic sheet.

(9) Tape plastic sheet in place with pressure sensitive tape.

(10) Cure repair (WP004 00).

(11) After cure, remove tape and plastic sheet.

(12) Sand surface smooth using 180 grit abrasive paper. Finish sanding surface smooth using 240 grit abrasive paper.

(13) Do NDI to make sure repair is complete (NAVAIR 01-1A-16).

(14) If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manuals, install applicable patches (WP007 00).

(15) If patch has been installed, do NDI to verify bond line integrity (NAVAIR 01-1A-16).



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ALUMINUM OR TITANIUM SKIN AND ALUMINUM HONEYCOMB CORE, CLASS IX DAMAGE REPAIR

## Reference Material

Nondestructive Inspection Methods .....	NAVAIR 01-1A-16
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Aluminum, Graphite Epoxy, or Titanium Patch Installation and Removal....	WP007 00

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required (Continued)

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
538A	Air Regulator Assembly, Oil-Water Separator and Gage	A-A-1047 GRIT 180-9X11, 240-9X11 855-1.000IN. 200SG40TR GG-N-196	Abrasive Paper  Pressure Sensitive Tape Plastic Sheet Hypodermic Syringe, Number 15
Materials Required			
Specification or Part Number	Nomenclature		
EA956 A/B CCC-C-440 TYPE 1, CLASS 1	Adhesive Cheesecloth	231849	Semco Needle, SEM- Needle, SEM 18-1/2 Pink
420 250-CP2-1/2	Sealing Gun Nozzles Sealant Gun Cartridges	231850	Semco Needle, SEM- Needle, SEM 18-1, Pink
		a. Drill 0.125 inch diameter holes through skin into each end of void. If void exceeds 3 inches in length, additional holes are required.	



b. Maintain minimum spacing of 1-1/2 inches between holes.

c. Position assembly, if possible, with drilled holes up and level.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Prepare adhesive (WP003 00).

## CAUTION

Semco needle must fill hole completely to be able to fill void with adhesive. Use pressure sensitive tape to seal around Semco-needle.

e. Attach hypodermic syringe or semco needle to sealant gun nozzle by trimming nozzle until needle fits tightly.

f. Inject adhesive at 40 psi into one hole until adhesive flows out next hole. Continue this procedure until adhesive flows clear from all holes.

g. Wipe off excess adhesive with clean dry cheesecloth.

h. Cover holes with plastic sheet taped in place with pressure sensitive tape.

i. Cure repair (WP004 00).

j. After cure, remove tape, plastic sheet. Sand surface smooth using 180 grit abrasive paper. Finish sanding surface smooth using 240 grit abrasive paper.

k. Wipe surface with clean dry cheesecloth.

l. Do NDI to make sure repair is complete (NAVAIR 01-1A-16).

m. If required by A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through 750 structure repair manual, install applicable patches (WP007 00).

n. If patch has been installed, do NDI to verify bond line integrity (NAVAIR 01-1A-16).

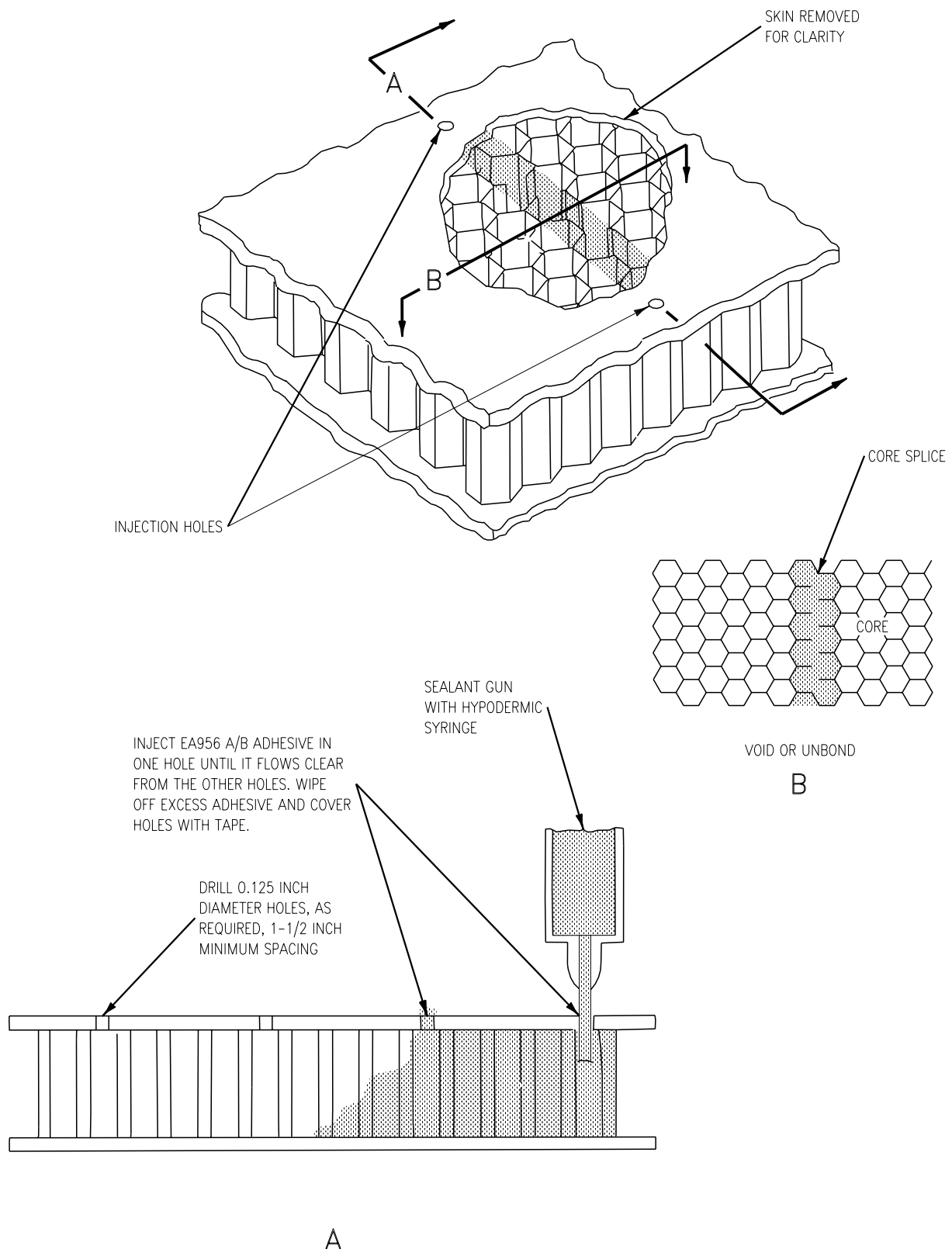


Figure 1. Class IX Damage Repair



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ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

ALUMINUM SHEET, FREE OF STRUCTURE AND LAND AREAS

---

## Reference Material

Structure Repair, General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application .....	WP011 00
Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Aluminum Patch Fabrication.....	WP006 01

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

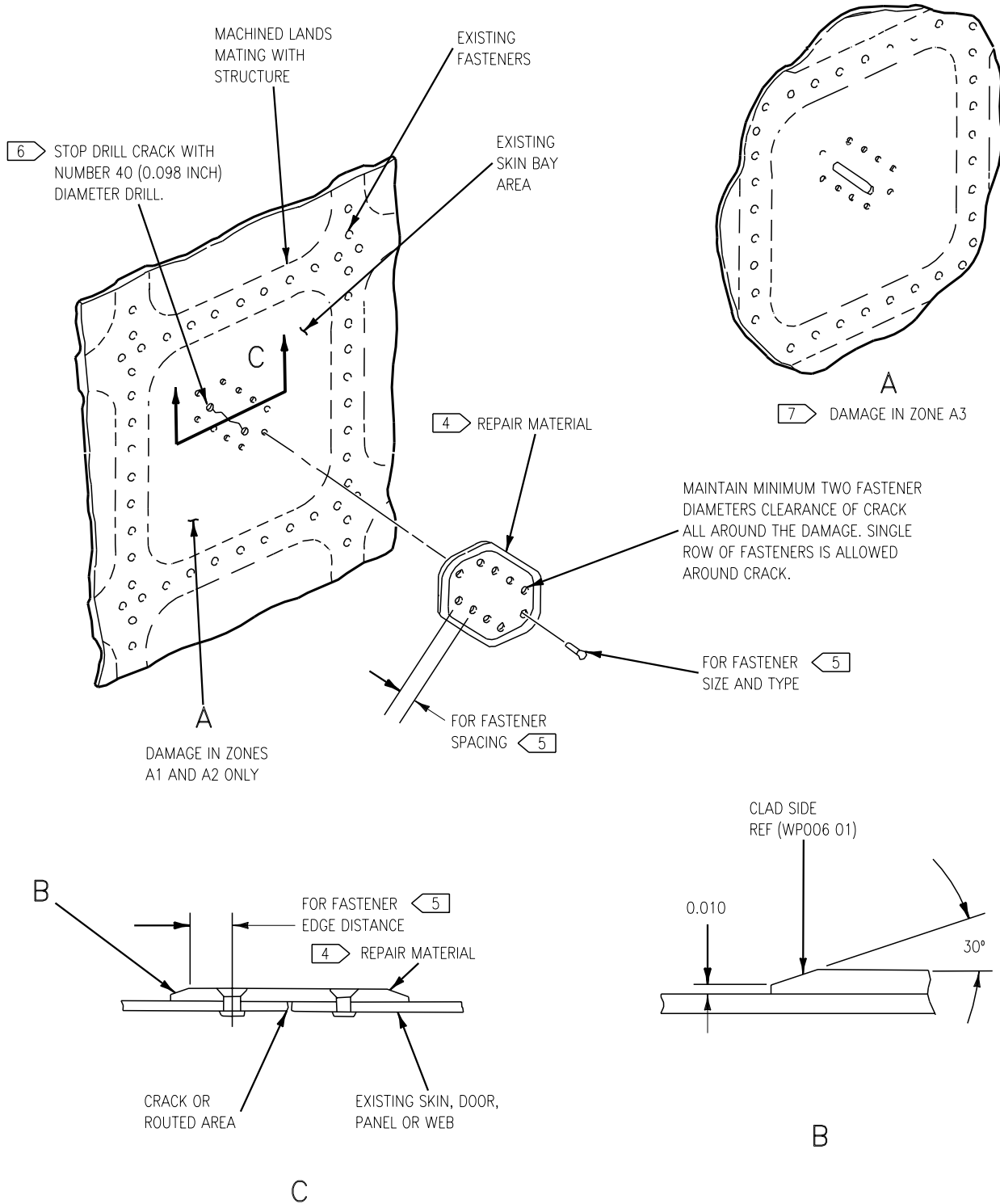
2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to stress intensity and repair zones. For stress intensity diagram and repair zones, refer to applicable structure repair manual in which part is shown. For method of repair refer to figure 1.

## Support Equipment Required

None

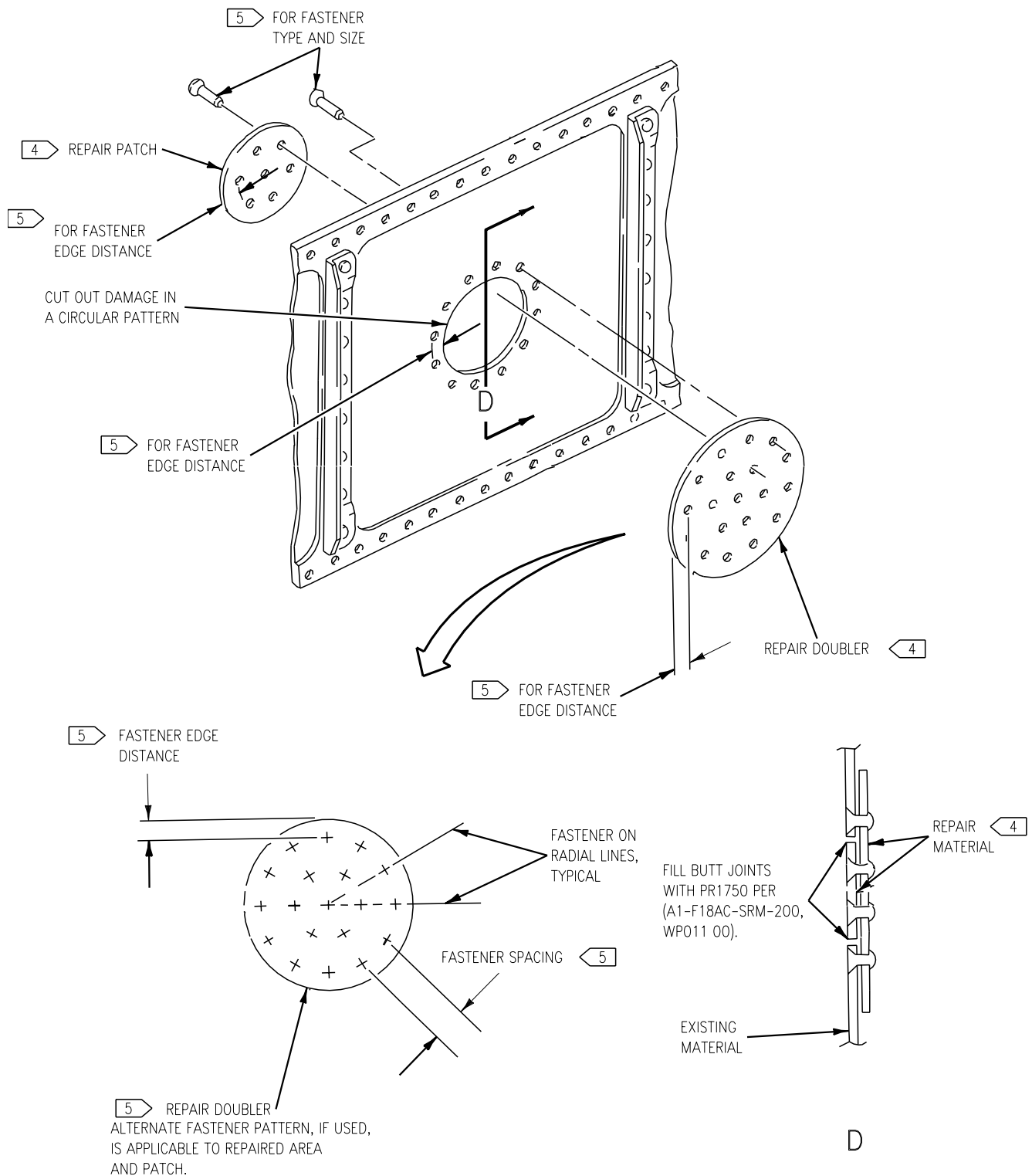
## Materials Required

None



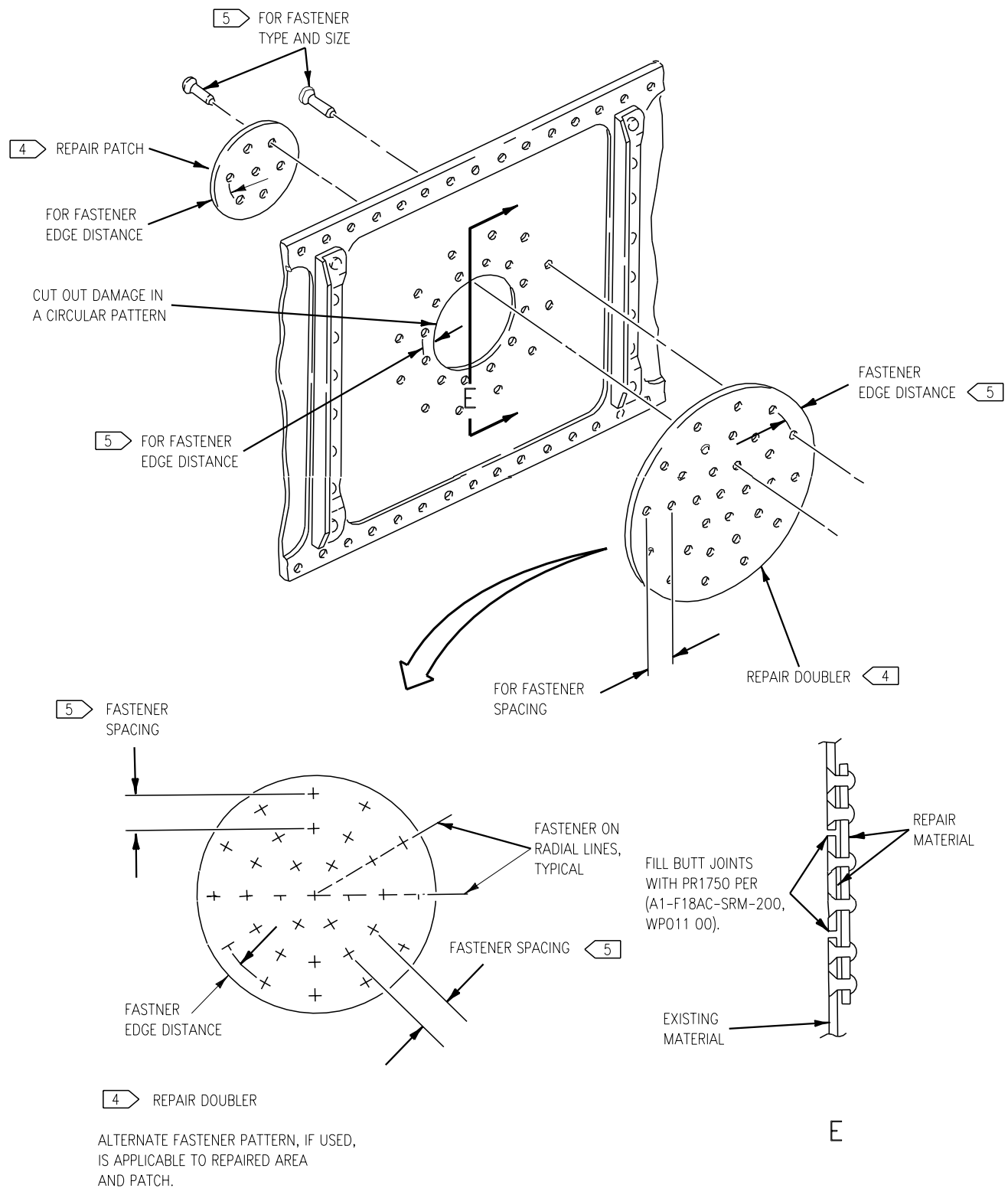
LAP PATCH REPAIR FOR CRACKS

Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 1)



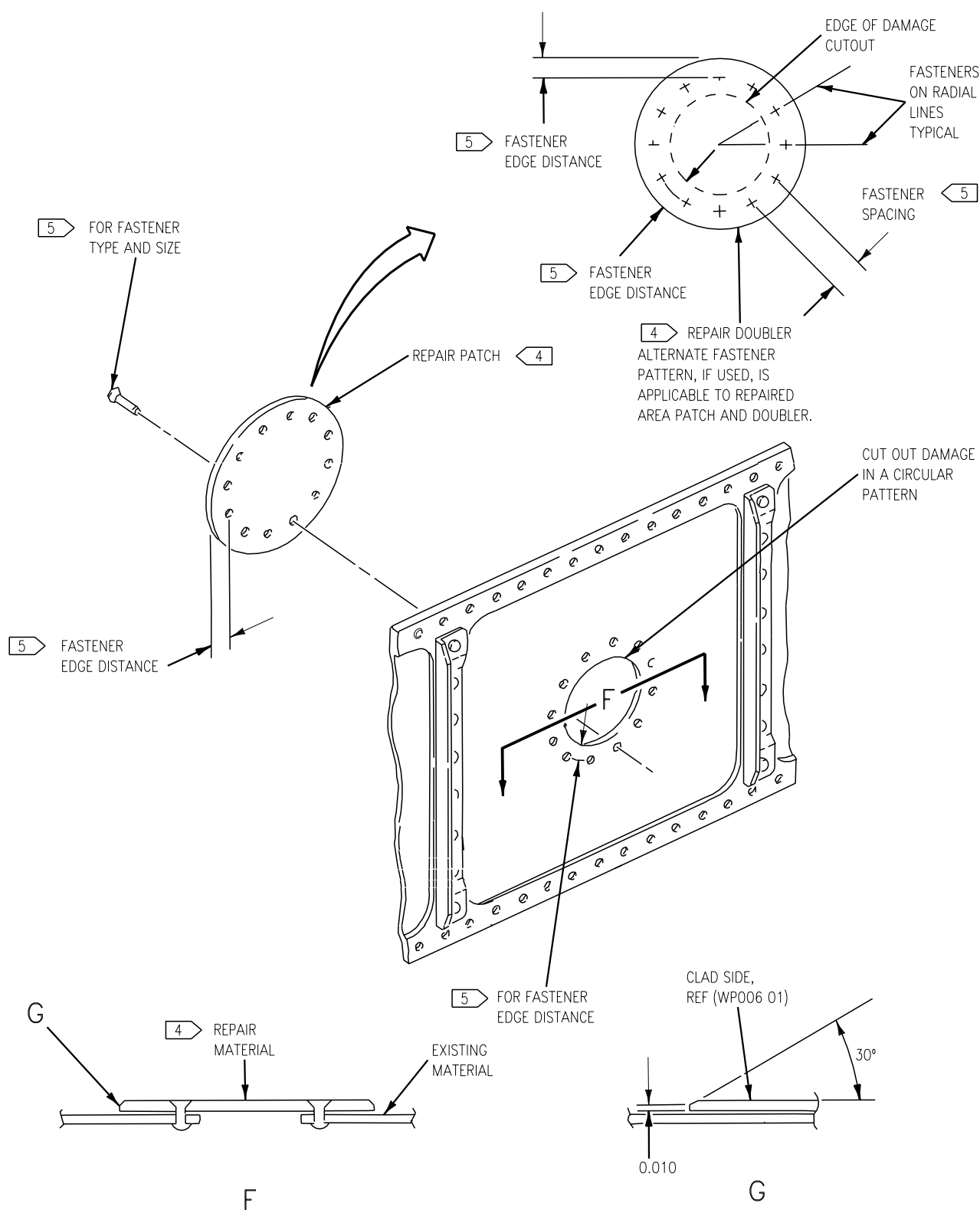
TYPE ONE FLUSH PATCH REPAIR

Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 2)



TYPE TWO FLUSH PATCH REPAIR

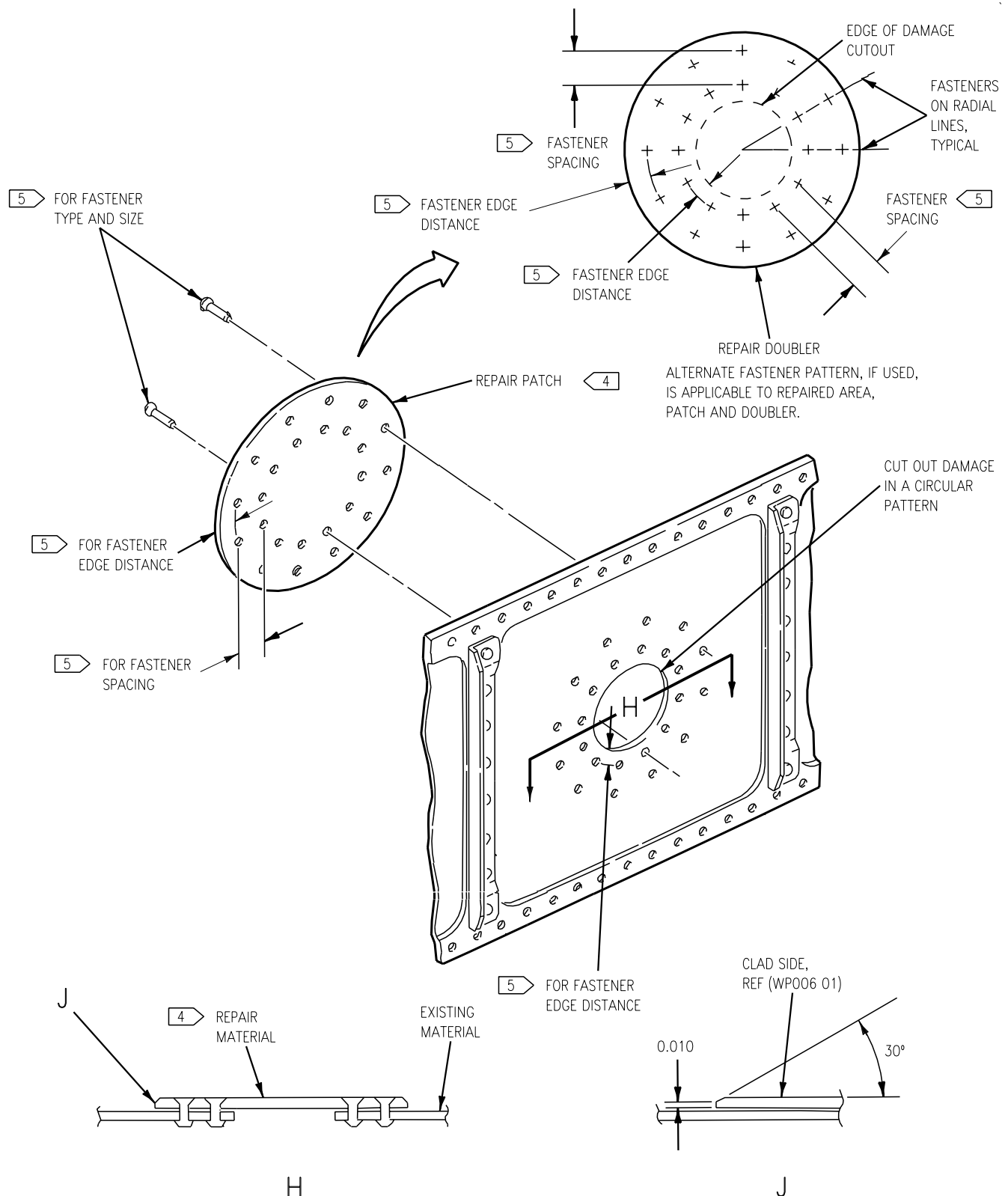
**Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 3)**



TYPE ONE LAP PATCH REPAIR

Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 4)





TYPE TWO LAP PATCH REPAIR

Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 5)






TABLE 1. MATERIALS

EXISTING MATERIAL	THICKNESS	REPAIR MATERIAL
7075, 6061, AND 2024-T6 	UP THRU 0.080	7075-T6 
	OVER 0.080	7075-T76 
2024-T72	ALL	2024-T72

TABLE 2. MATERIAL THICKNESS

EXISTING GAGE (DAMAGED)	REPAIR GAGE
0.012	0.012
0.013 TO 0.020	0.020
0.026 TO 0.032	0.032
0.033 TO 0.040	0.040
0.041 TO 0.050	0.050
0.051 TO 0.063	0.063
0.064 TO 0.071	0.071
0.072 TO 0.080	0.080
0.081 TO 0.090	0.090
0.091 TO 0.100	0.100
0.101 TO 0.125	0.125
0.126 TO 0.160	0.160
0.161 TO 0.190	0.190
0.191 AND UP	NO REPAIRS ALLOWED

TABLE 3. FASTENER SELECTION, EDGE DISTANCE, AND SPACING

STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH 	BRFS( )T( )	ST3M748-4-( )	0.040	0.28	0.50 TO 0.55
	BRFS( )T( )	ST3M748T-4-( )	0.050	0.28	0.50 TO 0.55
	HLT311DL-5-( )	ST3M758V08-( )	0.063	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.071	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.080	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.090	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.100	0.35	0.62 TO 0.68
	HLT51YB-5-( )	ST3M758C08-( )	0.125	0.35	0.62 TO 0.68
	HLT51YB-6-( )	ST3M758C-3-( )	0.160	0.41	0.75 TO 0.83
	HLT51YB-8-( )	ST3M758C-4-( )	0.190	0.53	1.00 TO 1.12
PROTRUDING 		MS20470AD4-( )	0.020	0.28	0.50 TO 0.55
		MS20470AD4-( )	0.025 	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.032	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.040	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.050	0.28	0.50 TO 0.55
	HLT310DL-5-( )	ST3M759V08-( )	0.063	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.071	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.080	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.090	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.100	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759V08-( )	0.125	0.35	0.62 TO 0.68
	HLT50YB-6-( )	ST3M759C-3-( )	0.160	0.41	0.75 TO 0.83
	HLT50YB-8-( )	ST3M759C-4-( )	0.190	0.53	1.00 TO 1.12

18AC-SRM-25-(39-6)28-CATI

Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 6)

TABLE 3. FASTENER SELECTION, EDGE DISTANCE, AND SPACING


BLIND FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH	PLT1058-5-( )	ST3M781-08-( )	0.063	0.35	0.62 TO 0.68
	PLT1098-5-( )	ST3M781-08-( )	0.071	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.080	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.090	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.100	0.35	0.62 TO 0.68
	_____	MS90353-05-( )	0.125	0.35	0.75 TO 0.83
	_____	MS90353-06-( )	0.160	0.41	1.00 TO 1.12
	_____	MS90353-08-( )	0.190	0.53	
PROTRUDING	_____	NAS1398C-(4)A( )	0.020	0.28	0.50 TO 0.55
	_____	NAS1398C-(4)A( )	0.025	0.28	0.50 TO 0.55
	_____	NAS1398C-(4)A( )	0.032 	0.28	0.50 TO 0.55
	_____	NAS1398C-(4)A( )	0.040	0.28	0.50 TO 0.55
	_____	NAS1398C-(4)A( )	0.050	0.28	0.50 TO 0.55
	_____	MS90354-05-( )	0.063	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.071	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.080	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.090	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.100	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.125	0.35	0.62 TO 0.68
	_____	MS90354-06-( )	0.160	0.41	0.75 TO 0.83
	_____	MS90354-08-( )	0.190	0.53	1.00 TO 1.12

TABLE 4. FASTENER SELECTION, EDGE DISTANCE, AND SPACING  
TO BE USED IN OR NEAR INLETS

11 STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH	BRFS( )T( )	ST3M748T-4-( )	0.040	0.28	0.50 TO 0.55
	BRFS( )T( )	ST3M748T-4-( )	0.050	0.28	0.50 TO 0.55
		NAS2705V( )	0.063	0.35	0.62 TO 0.68
		NAS2705V( )	0.071	0.35	0.62 TO 0.68
		NAS2705V( )	0.080	0.35	0.62 TO 0.68
		NAS2705V( )	0.090	0.35	0.62 TO 0.68
		NAS2705V( )	0.100	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-5-( )	0.125	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-6-( )	0.160	0.41	0.75 TO 0.83
	2705MU-( )	ST3M509-8-( )	0.190	0.53	1.00 TO 1.12
PROTRUDING		MS20470AD4-( )	0.012	0.28	0.50 TO 0.55
		MS20470AD4-( )	0.020	0.28	0.50 TO 0.55
		MS20470AD4-( )	0.025	10	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.032	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.040	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.050	0.28	0.50 TO 0.55
		NAS2605V( )	0.063	0.35	0.62 TO 0.68
		NAS2605V( )	0.071	0.35	0.62 TO 0.68
		NAS2605V( )	0.080	0.35	0.62 TO 0.68
		NAS2605V( )	0.090	0.35	0.62 TO 0.68
		NAS2605V( )	0.100	0.35	0.62 TO 0.68
	2605MU( )	ST3M512-5-( )	0.125	0.35	0.62 TO 0.68
	2605MU( )	ST3M512-6-( )	0.160	0.41	0.75 TO 0.83
	2605MU( )	ST3M512-8-( )	0.190	0.53	1.00 TO 1.12

TABLE 5. FASTENER SELECTION, EDGE DISTANCE, AND SPACING  
TO BE USED IN OR NEAR INLETS

11 12 BLIND FASTENERS				
	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH	NAS1399C4A( )	0.063	0.28	0.50 TO 0.55
	NAS1399C4A( )	0.071	0.28	0.50 TO 0.55
	NAS1399C5A( )	0.080	0.35	0.62 TO 0.68
	NAS1399C5A( )	0.090	0.35	0.62 TO 0.68
	NAS1399C6A( )	0.100	0.41	0.75 TO 0.83
	NAS1399C6A( )	0.125	0.41	0.75 TO 0.83
	NAS1399C8A( )	0.160	0.53	1.00 TO 1.12
	NAS1399C8A( )	0.190	0.53	1.00 TO 1.12
PROTRUDING	NAS1398C-4A( )	0.012	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.020	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.025	10	0.50 TO 0.55
	NAS1398C-4A( )	0.032	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.040	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.050	0.28	0.50 TO 0.55
	NAS1398C-5A( )	0.063	0.35	0.62 TO 0.68
	NAS1398C-5A( )	0.071	0.35	0.62 TO 0.68
	NAS1398C-5A( )	0.080	0.35	0.62 TO 0.68
	NAS1398C-5A( )	0.090	0.35	0.62 TO 0.68
	NAS1398C-5A( )	0.100	0.35	0.62 TO 0.68
	NAS1398C-5A( )	0.125	0.35	0.62 TO 0.68
	NAS1398C-6A( )	0.160	0.41	0.75 TO 0.83
	NAS1398C-8A( )	0.190	0.53	1.00 TO 1.12

18AC-SRM-25-(39-8)28-CATI

Figure 1. Aluminum Sheet, Free of Structure and Land Areas (Sheet 8)

## LEGEND

1. SHEET METAL REPAIRS ARE NOT ALLOWED ON MATERIAL MORE THAN 0.190 INCH THICK.
2. REFER TO TABLES 4 AND 5 FOR FASTENERS TO BE USED IN OR NEAR INLETS.
3. WHEN MAKING REPAIRS AFFECTING EXISTING FASTENERS, CONSULT LOCAL ENGINEERING FOR REPLACEMENT FASTENERS.
4. REFER TO TABLE 1 FOR TYPE OF MATERIAL, AND TABLE 2 FOR MATERIAL GAGE.
5. REFER TO TABLE 3 FOR FASTENER SELECTION, SPACING, AND EDGE DISTANCE.
6. USE NUMBER 40,(0.098) INCH DIAMETER, DRILL FOR STOP DRILLING CRACKS IN ZONES A1 AND A2. REFER TO APPLICABLE STRUCTURE REPAIR MANUAL FOR STRESS INTENSITY ZONES.
7. DAMAGE IN ZONE A3 MUST BE ROUTED OUT TO 3/16-INCH MINIMUM DIAMETER RADIUS. REFER TO APPLICABLE STRUCTURE REPAIR MANUAL FOR STRESS INTENSITY ZONES, SEE VIEW A.
8. WHEN USING EXISTING 6061 OR 7075 MATERIAL, ANY TEMPER IS ALLOWED FOR THICKNESS UP TO AND INCLUDING 0.080 INCH THICK.
9. WHEN MAKING REPAIRS USING 6061 OR 7075 MATERIAL, USE T6 FOR THICKNESS UP TO AND INCLUDING 0.080 INCH THICK. USE T76 FOR THICKNESS ABOVE 0.080 INCH THICK. REFER TO TABLE 1.
10. ALUMINUM SHEET 0.025 INCH THICK IS NOT USED FOR FORMED STRUCTURE.
11. BLIND FASTENERS ARE ALLOWED IN OR NEAR INLETS ONLY IF FASTENER HOLE INTERIOR IS NOT ACCESSABLE AND A BLIND FASTENER IS THE ONLY ALTERNATE. SEE TABLE 5.
12. GRIP GAGE EACH HOLE TO DETERMINE CORRECT FASTENER LENGTH. INSTALL BLIND FASTENERS WET WITH MIL-S-83430 (A1-F18AC-SRM-200, WP 011 00).

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ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

TITANIUM SHEET, FREE OF STRUCTURE AND LAND AREAS

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**Reference Material**

Structure Repair, General Information .....	A1-F18AC-SRM-200
Shop Practices .....	WP004 06
Adhesive, Cement, and Sealant; Preparation and Application .....	WP011 00

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**Record of Applicable Technical Directives**

None

1. **PROCEDURE.** See figure 1.

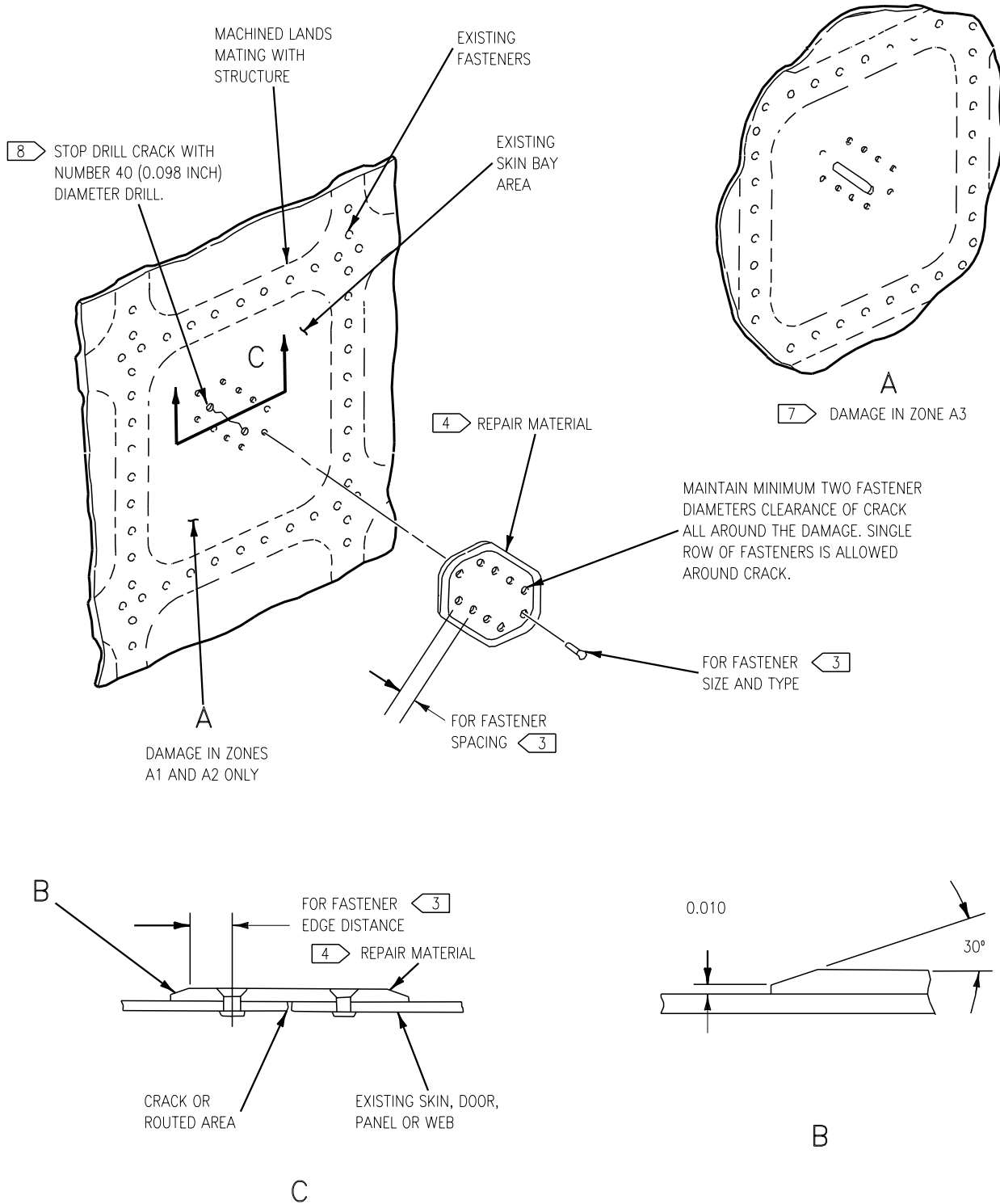
2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to stress intensity and repair zones. For stress intensity diagram and repair zones, refer to applicable structure repair manual in which part is shown. For method of repair, refer to figure 1.

**Support Equipment Required**

None

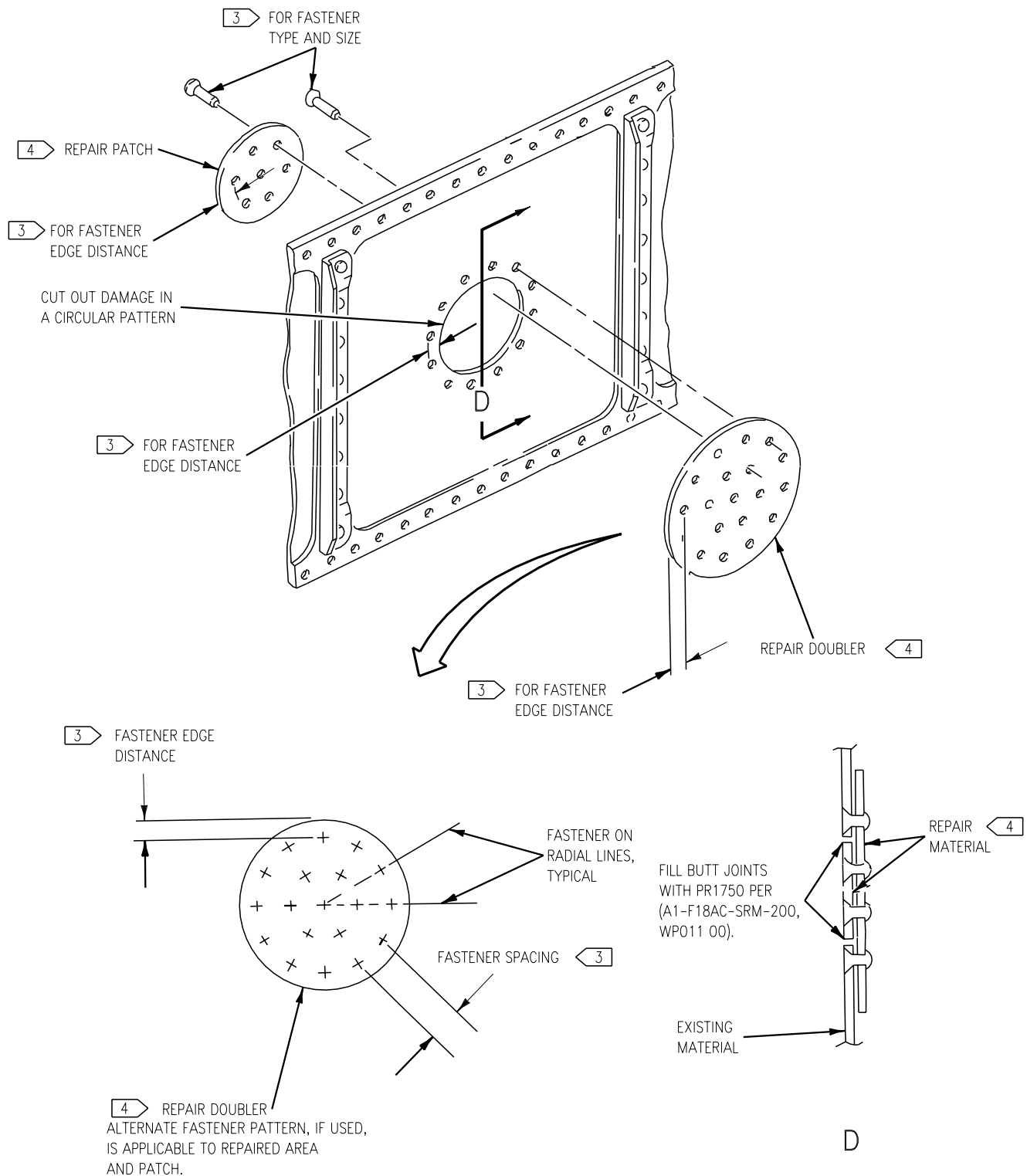
**Materials Required**

None



LAP PATCH REPAIR FOR CRACKS

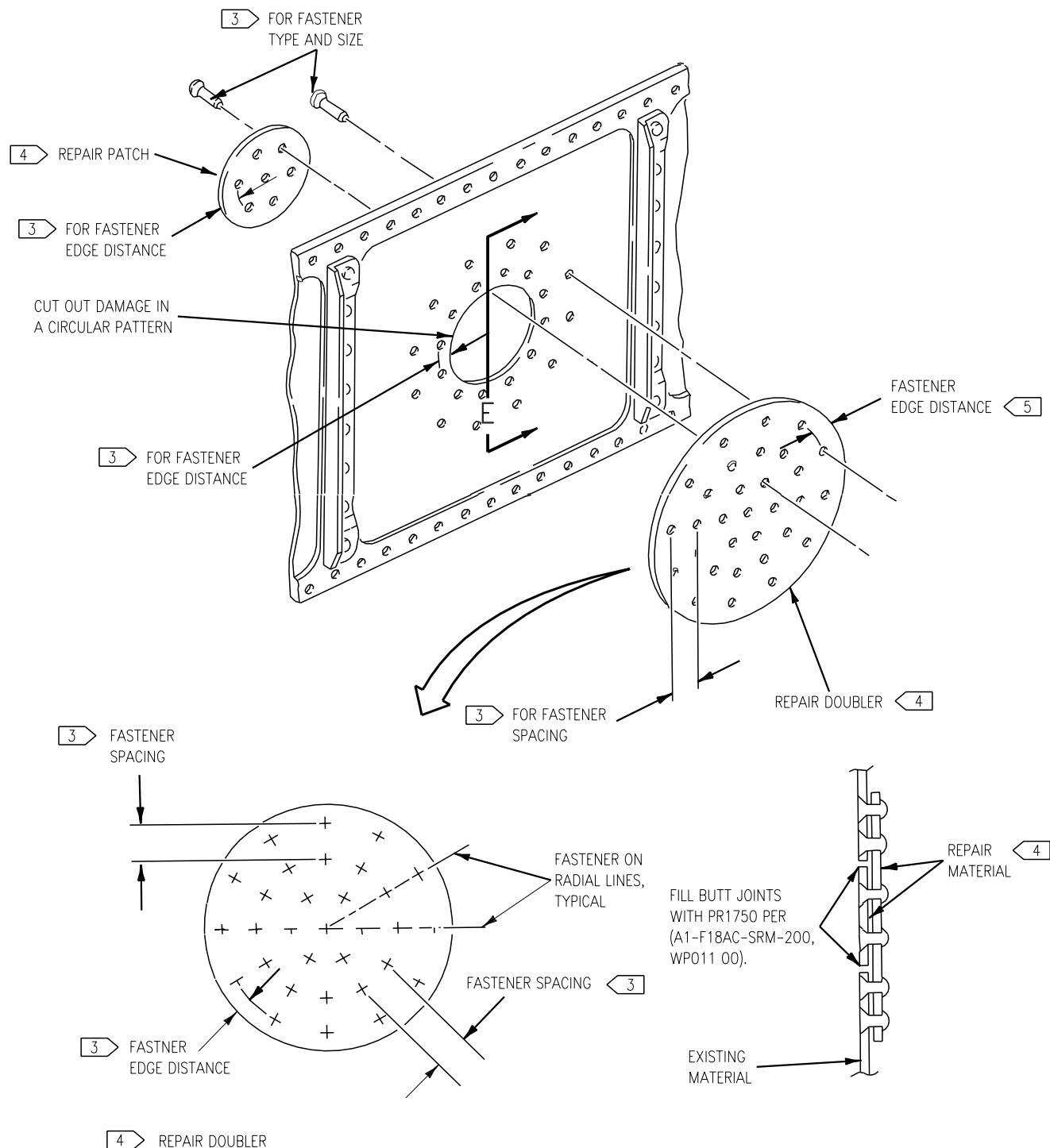
Figure 1. Titanium Sheet, Free of Structure and Land Areas (Sheet 1)



TYPE ONE FLUSH PATCH REPAIR

Figure 1. Titanium Sheet, Free of Structure and Land Areas (Sheet 2)





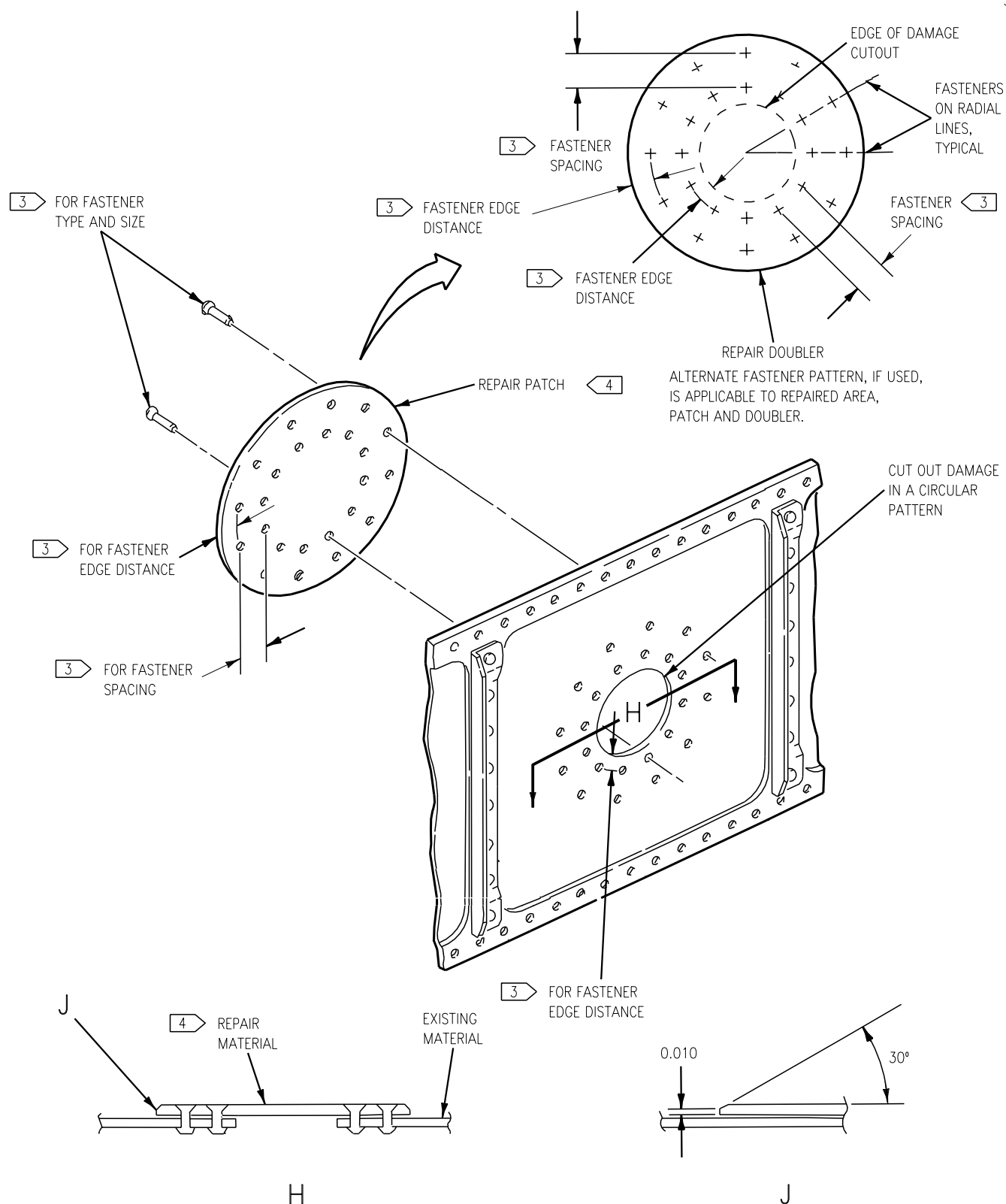
ALTERNATE FASTENER PATTERN, IF USED,  
IS APPLICABLE TO REPAIRED AREA  
AND PATCH.

E

## TYPE TWO FLUSH PATCH REPAIR

Figure 1. Titanium Sheet, Free of Structure and Land Areas (Sheet 3)





## TYPE TWO LAP PATCH REPAIR

**Figure 1. Titanium Sheet, Free of Structure and Land Areas (Sheet 5)**

TABLE 1. MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING


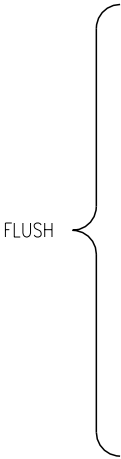

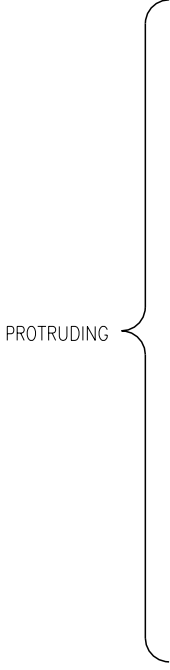

STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS 	EDGE DISTANCE	SPACING
FLUSH 	BRFS( )T( )	ST3M748T-5-( )	0.050	0.35	0.62 TO 0.68
	HLT51YB-5-( )	ST3M758C08-( )	0.063	0.35	0.62 TO 0.68
	HLT51YB-5-( )	ST3M758C08-( )	0.071	0.35	0.62 TO 0.68
	HLT51YB-5-( )	ST3M758C08-( )	0.080	0.35	0.62 TO 0.68
	HLT51YB-6-( )	ST3M758C3-( )	0.090	0.41	0.75 TO 0.83
	HLT51YB-8-( )	ST3M758C4-( )	0.100	0.53	1.00 TO 1.12
	HLT51YB-8-( )	ST3M758C4-( )	0.125	0.53	1.00 TO 1.12
	HLT51YB-8-( )	ST3M758C4-( )	0.160	0.53	1.00 TO 1.12
	HLT51YB-8-( )	ST3M758C4-( )	0.190 	0.53	1.00 TO 1.12
PROTRUDING 	CSR903B-5-( )	ST3M676-5-( )	0.020	0.35	0.62 TO 0.68
	CSR903B-5-( )	ST3M676-5-( )	0.025	0.35	0.62 TO 0.68
	CSR903B-6-( )	ST3M676-6-( )	0.032	0.41	0.75 TO 0.83
	HLT310DL-5-( )	ST3M759V08-( )	0.040	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.050	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759C08-( )	0.063	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759C08-( )	0.071	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759C08-( )	0.080	0.35	0.62 TO 0.68
	HLT50YB-6-( )	ST3M759C3-( )	0.090	0.41	0.75 TO 0.83
	HLT50YB-8-( )	ST3M759C4-( )	0.100	0.53	1.00 TO 1.12
	HLT50YB-8-( )	ST3M759C4-( )	0.125	0.53	1.00 TO 1.12
	HLT50YB-8-( )	ST3M759C4-( )	0.160	0.53	1.00 TO 1.12
	HLT50YB-8-( )	ST3M759C4-( )	0.190 	0.53	1.00 TO 1.12

Figure 1. Titanium Sheet, Free of Structure and Land Areas (Sheet 6)

TABLE 2. MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING






BLIND FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS 	EDGE DISTANCE	SPACING
FLUSH 	PLT1058-5-( )	ST3M781-08-( )	0.063	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.071	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.080	0.35	0.62 TO 0.68
	PLT1058-6-( )	ST3M781-3-( )	0.090	0.41	0.75 TO 0.83
	PLT1058-8-( )	ST3M781-4-( )	0.100	0.53	1.00 TO 1.12
	PLT1058-8-( )	ST3M781-4-( )	0.125	0.53	1.00 TO 1.12
	_____	MS90353-08-( )	0.160	0.53	1.00 TO 1.12
	_____	MS90353-08-( )	0.190 	0.53	1.00 TO 1.12
PROTRUDING 	PLT270-5-( )	ST3M790-08-( )	0.020	0.35	0.62 TO 0.68
	PLT270-5-( )	ST3M790-08-( )	0.025	0.35	0.62 TO 0.68
	PLT270-6-( )	ST3M790-3-( )	0.032	0.41	0.75 TO 0.83
	_____	MS90354-05-( )	0.040	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.050	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.063	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.071	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.080	0.35	0.62 TO 0.68
	_____	MS90354-06-( )	0.090	0.41	0.75 TO 0.83
	_____	MS90354-08-( )	0.100	0.53	1.00 TO 1.12
	_____	MS90354-08-( )	0.125	0.53	1.00 TO 1.12
	_____	MS90354-08-( )	0.160	0.53	1.00 TO 1.12
	_____	MS90354-08-( )	0.190 	0.53	1.00 TO 1.12

TABLE 3. MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING TO BE USED IN OR NEAR INLETS

6 STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS 4	EDGE DISTANCE	SPACING
FLUSH	BRFS( )T( )	ST3M748T5-( )	0.050	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-5-( )	0.063	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-5-( )	0.071	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-5-( )	0.080	0.35	0.62 TO 0.68
	2706MU-( )	ST3M509-6-( )	0.090	0.41	0.75 TO 0.83
	2708MU-( )	ST3M506-8-( )	0.100	0.53	1.00 TO 1.12
	2708MU-( )	ST3M509-8-( )	0.125	0.53	1.00 TO 1.12
	2708MU-( )	ST3M509-8-( )	0.160	0.53	1.00 TO 1.12
	2708MU-( )	ST3M509-8-( )	0.190 5	0.53	1.00 TO 1.12
PROTRUDING	CSR903B-( )-( )	ST3M676-5-( )	0.012	0.35	0.62 TO 0.68
	CSR903B-( )-( )	ST3M676-5-( )	0.020	0.35	0.62 TO 0.68
	CSR903B-( )-( )	ST3M676-5-( )	0.025	0.35	0.62 TO 0.68
	CSR903B-( )-( )	ST3M676-6-( )	0.032	0.41	0.75 TO 0.83
	_____	NAS2605V	0.040	0.35	0.62 TO 0.68
	_____	NAS2605V	0.050	0.35	0.62 TO 0.68
	2605MU	ST3M512-5-( )	0.063	0.35	0.62 TO 0.68
	2605MU	ST3M512-5-( )	0.071	0.35	0.62 TO 0.68
	2605MU	ST3M512-5-( )	0.080	0.35	0.62 TO 0.68
	2606MU	ST3M512-6-( )	0.090	0.41	0.75 TO 0.83
	2608MU	ST3M512-8-( )	0.100	0.53	1.00 TO 1.12
	2608MU	ST3M512-8-( )	0.125	0.53	1.00 TO 1.12
	2608MU	ST3M512-8-( )	0.160	0.53	1.00 TO 1.12
	2608MU	ST3M512-8-( )	0.190 5	0.53	1.00 TO 1.12

Figure 1. Titanium Sheet, Free of Structure and Land Areas (Sheet 8)

TABLE 4. FASTENER SELECTION, EDGE DISTANCE, AND SPACING  
TO BE USED IN OR NEAR INLETS

6 9 BLIND FASTENERS			
FLUSH			
MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
NAS1399C4A( )	0.063	0.28	0.50 TO 0.55
NAS1399C4A( )	0.071	0.28	0.50 TO 0.55
NAS1399C5A( )	0.080	0.35	0.62 TO 0.68
NAS1399C5A( )	0.090	0.35	0.62 TO 0.68
NAS1399C6A( )	0.100	0.41	0.75 TO 0.83
NAS1399C6A( )	0.125	0.41	0.75 TO 0.83
NAS1399C8A( )	0.160	0.53	1.00 TO 1.12
NAS1399C8A( )	0.190 5	0.53	1.00 TO 1.12
PROTRUDING			
NAS1398C-4A( )	0.012	0.28	0.50 TO 0.55
NAS1398C-4A( )	0.020	0.28	0.50 TO 0.55
NAS1398C-4A( )	0.025	0.28	0.50 TO 0.55
NAS1398C-4A( )	0.032	0.28	0.50 TO 0.55
NAS1398C-4A( )	0.040	0.28	0.50 TO 0.55
NAS1398C-4A( )	0.050	0.28	0.50 TO 0.55
NAS1398C-5A( )	0.063	0.35	0.62 TO 0.68
NAS1398C-5A( )	0.071	0.35	0.62 TO 0.68
NAS1398C-5A( )	0.080	0.35	0.62 TO 0.68
NAS1398C-5A( )	0.090	0.35	0.62 TO 0.68
NAS1398C-5A( )	0.100	0.35	0.62 TO 0.68
NAS1398C-5A( )	0.125	0.35	0.62 TO 0.68
NAS1398C-6A( )	0.160	0.41	0.75 TO 0.83
NAS1398C-8A( )	0.190 5	0.53	1.00 TO 1.12

## LEGEND

1. WHEN MAKING REPAIRS AFFECTING EXISTING FASTENERS, CONSULT LOCAL ENGINEERING FOR REPLACEMENT FASTENERS.

2. REFER TO TABLES 3 AND 4 FOR FASTENERS TO BE USED IN OR NEAR INLETS.

3 REFER TO TABLES 1 AND 2 FOR MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING. FASTENER REMOVAL AND INSTALLATION (A1-F18AC-SRM-200, WP 004 06).

4 USE 6AL-4V-Ti MATERIAL FOR MAKING REPAIRS.

5 NO REPAIRS ARE ALLOWED FOR MATERIAL 0.191 INCH THICK AND UP.

6 BLIND FASTENERS ARE ALLOWED IN OR NEAR INLETS ONLY IF FASTENER HOLE INTERIOR IS NOT ACCESSIBLE AND A BLIND FASTENER IS THE ONLY ALTERNATE. SEE TABLE FOUR.

7 DAMAGE IN ZONE A3 MUST BE ROUTED OUT TO 3/16-INCH MINIMUM DIAMETER RADIUS. REFER TO APPLICABLE STRUCTURE REPAIR MANUAL FOR STRESS INTENSITY ZONES, SEE VIEW A.

8 USE NUMBER 40, (0.098) INCH DIAMETER DRILL FOR STOP DRILLING CRACKS IN ZONES A1 AND A2. REFER TO APPLICABLE STRUCTURE REPAIR MANUAL FOR STRESS INTENSITY ZONES, SEE VIEW A.

9 GRIP GAGE EACH HOLE TO DETERMINE CORRECT FASTENER LENGTH. INSTALL BLIND FASTENERS WET WITH MIL-S-83430 (A1-F18AC-SRM-200, WP 011 00).

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ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

ALUMINUM AND TITANIUM SHEET, FORMED STRUCTURE

---

## Reference Material

None

## Alphabetical Index

## Subject

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to its stress intensity and repair zones. For stress intensity diagram and repair zones, refer to applicable structure repair manual in which part is shown. For method of repair, refer to figure 1.

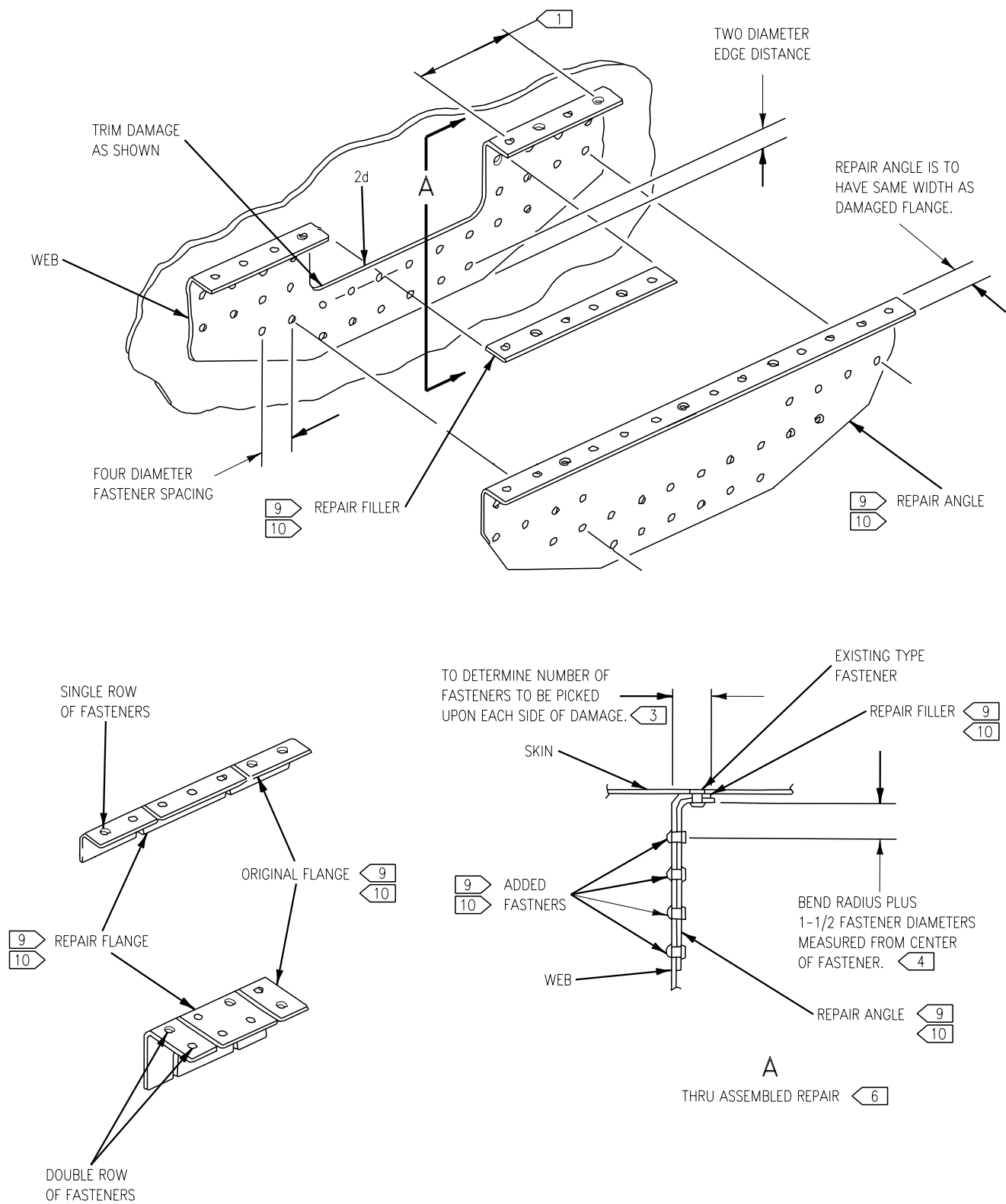
## Support Equipment Required

None

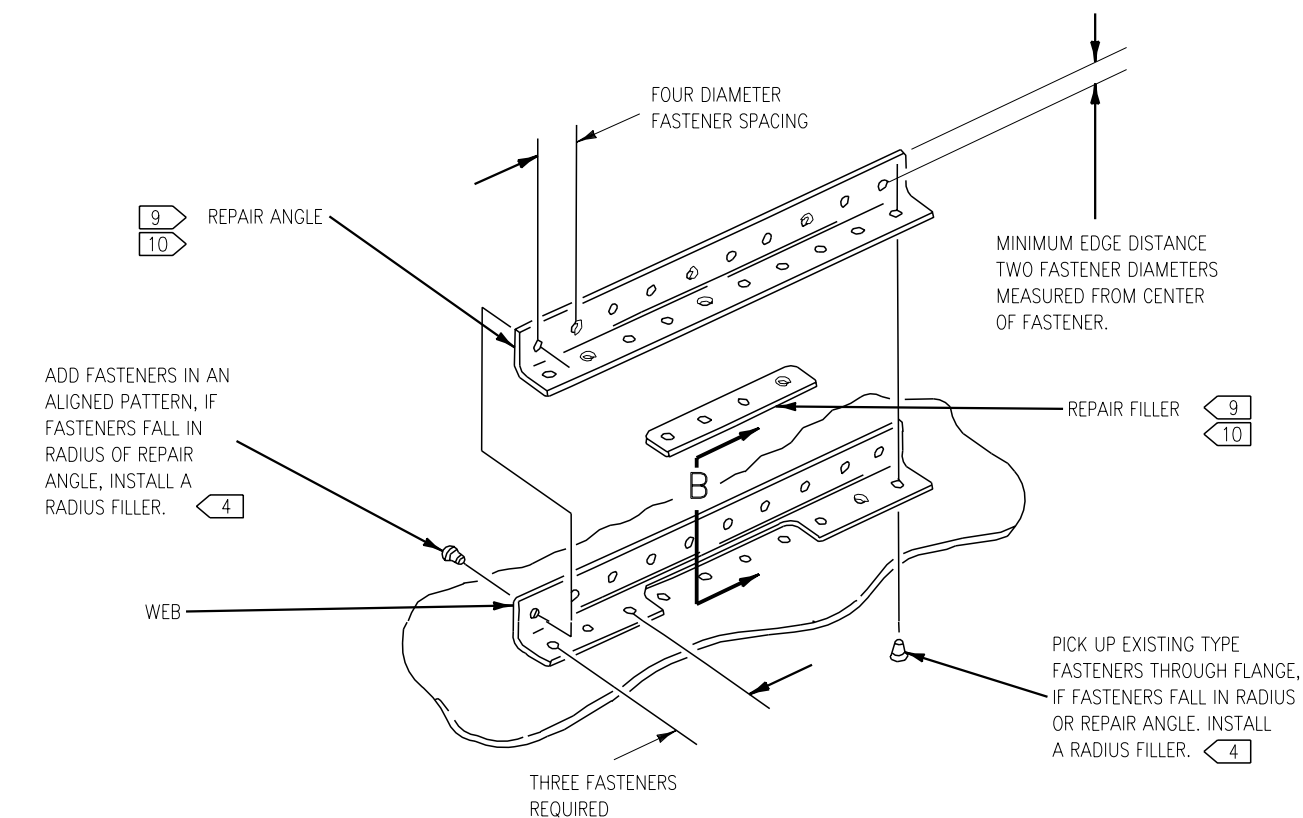
## Materials Required

None

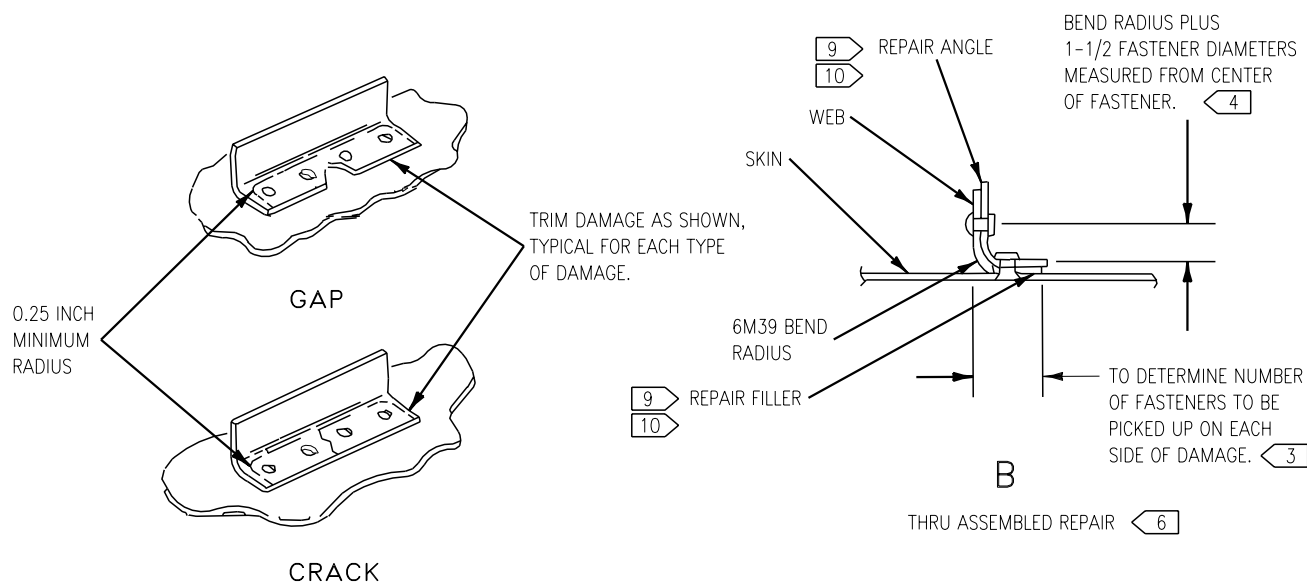




**Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 1)**

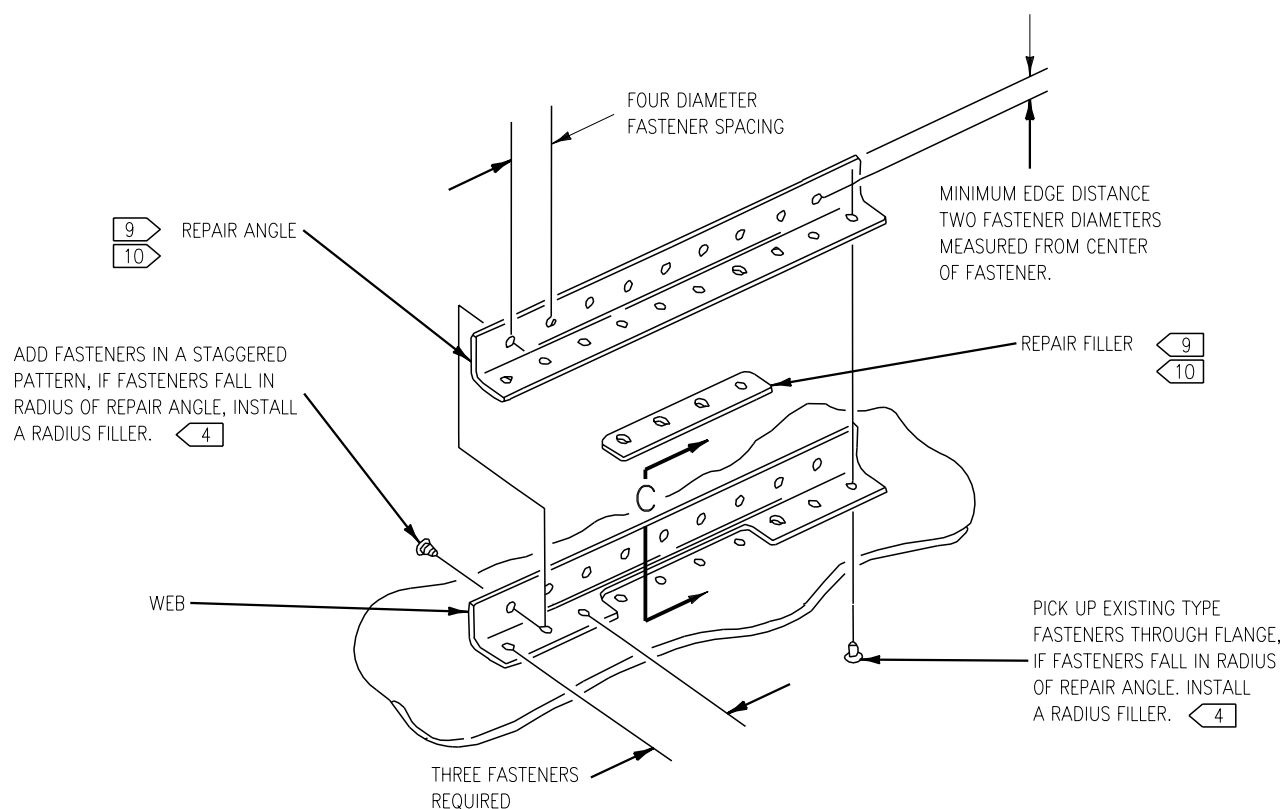


## ALIGNED PATTERN

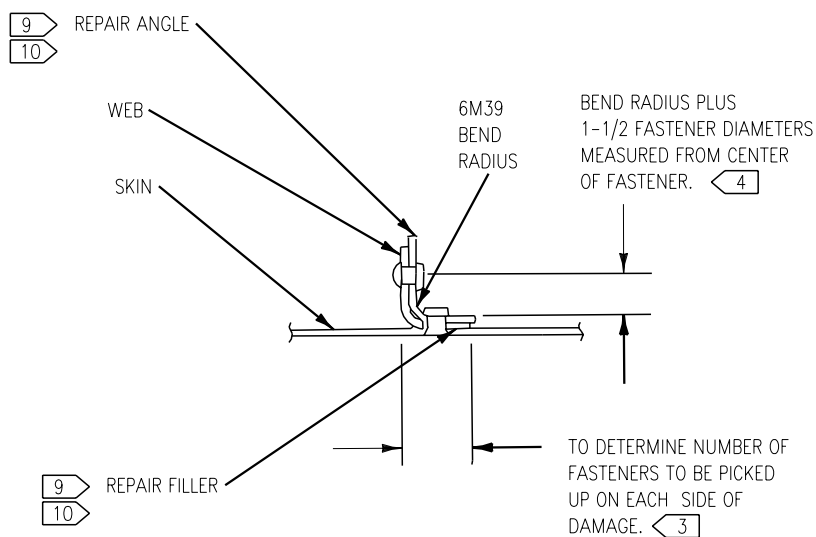


## REPAIR TWO

Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 2)



## STAGGERED PATTERN

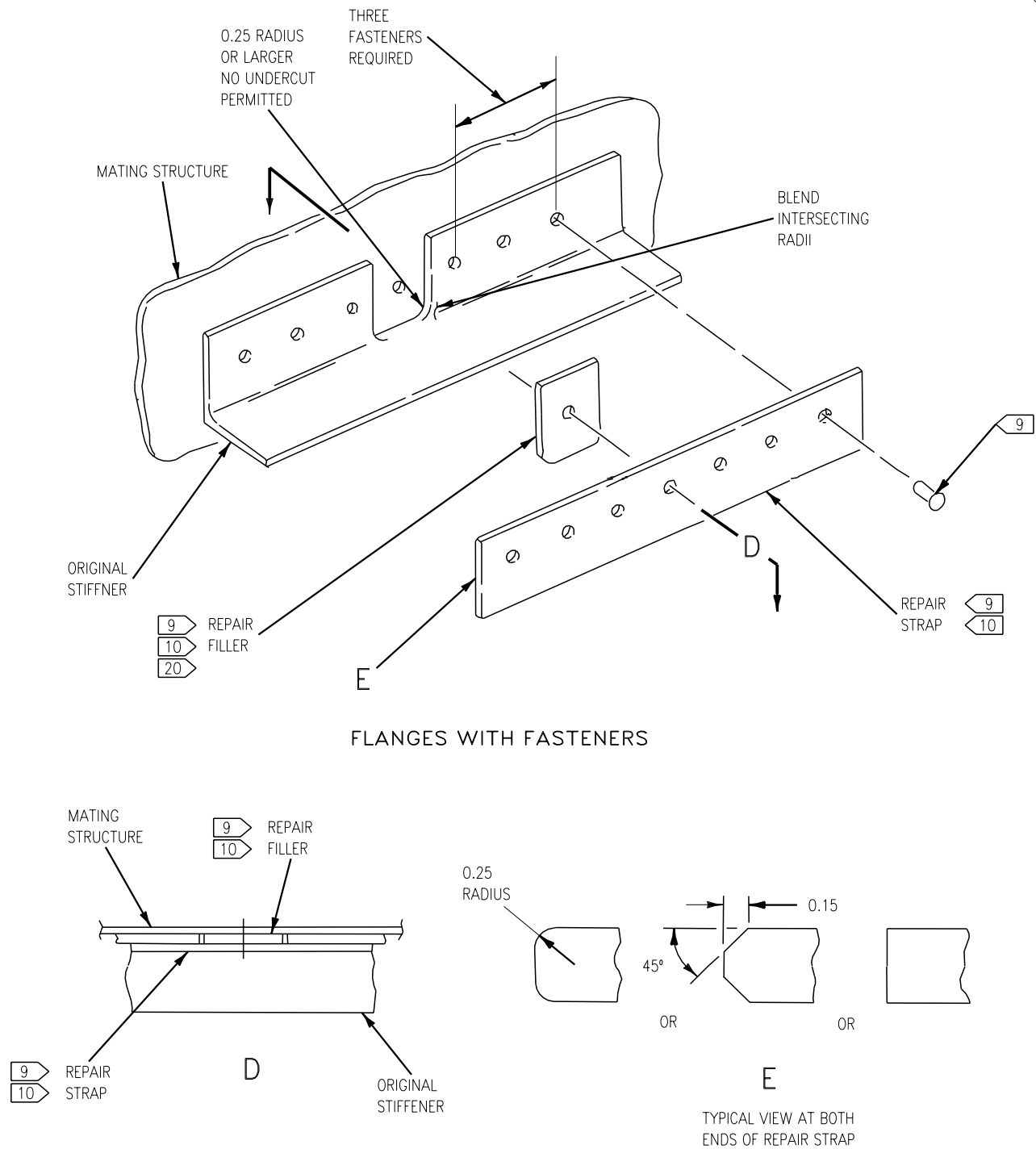


C

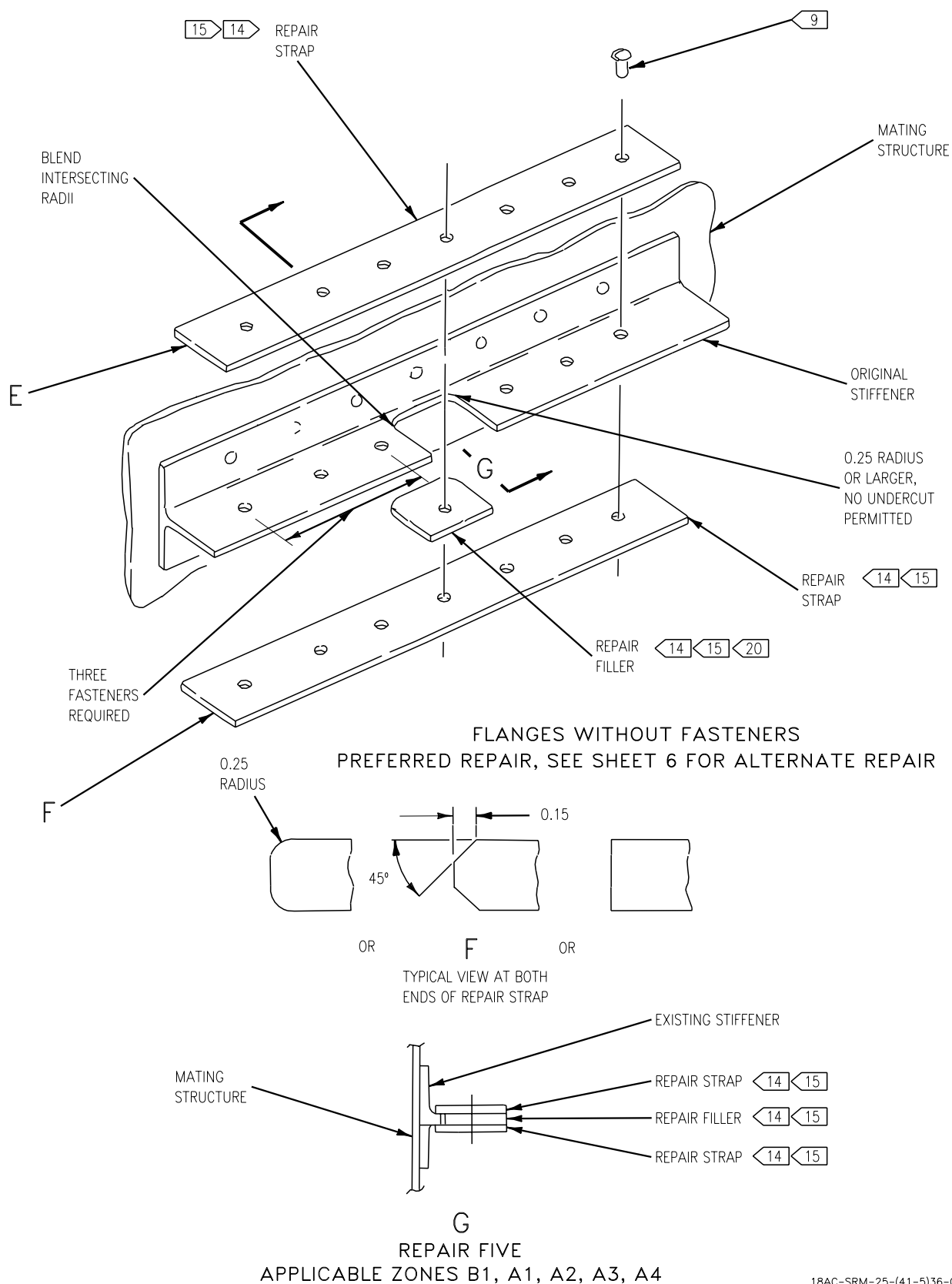
THRU ASSEMBLED REPAIR 6

## REPAIR THREE

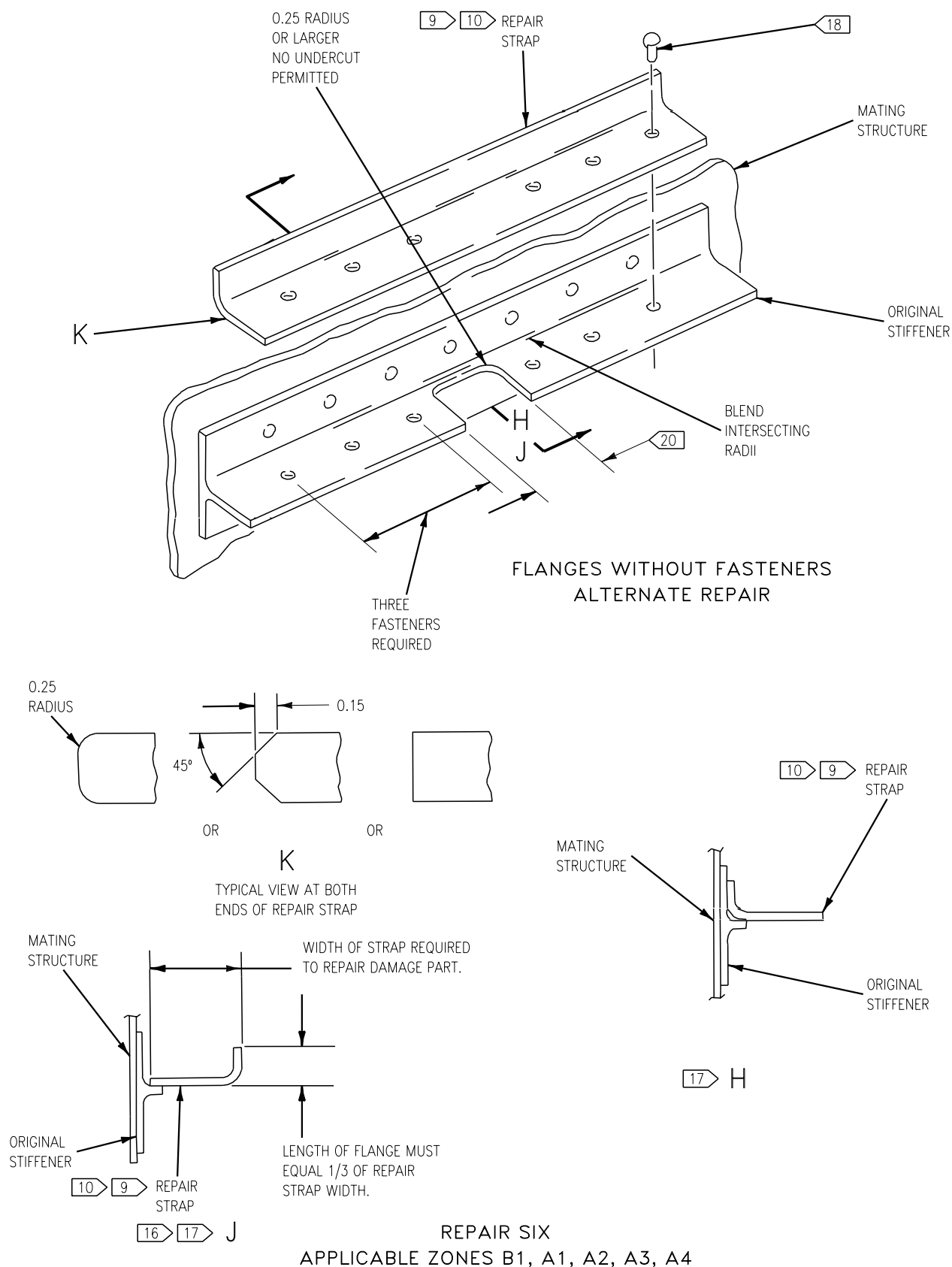
Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 3)



**Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 4)**



**Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 5)**



**Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 6)**

TABLE 1. MATERIALS



EXISTING MATERIAL	THICKNESS	REPAIR MATERIAL
7075-T6, 7075-T76, 7075-T62, 7075-T73, 6061-T6, 6061-T62, 7075-T7351, 7075-T751, AND 7075-T76511	UP THRU 0.080	7075-T6 
	OVER 0.080	7075-T76 
2024-T72	ALL	2024-T72

TABLE 2. MATERIAL THICKNESS

EXISTING GAGE (DAMAGED)	REPAIR GAGE
0.012	0.012
0.013 TO 0.020	0.020
0.026 TO 0.032	0.032
0.033 TO 0.040	0.040
0.041 TO 0.050	0.050
0.051 TO 0.063	0.063
0.064 TO 0.071	0.071
0.072 TO 0.080	0.080
0.081 TO 0.090	0.090
0.091 TO 0.100	0.100
0.101 TO 0.125	0.125
0.126 TO 0.160	0.160
0.161 TO 0.190	0.190
0.191 AND UP	NO REPAIRS ALLOWED

TABLE 3. ALUMINUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING









STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS 	EDGE DISTANCE	SPACING
PROTRUDING 		MS20470AD-4-( )	0.020	0.28	0.50 TO 0.55
		MS20470AD-4-( )	0.025 	0.28	0.50 TO 0.55
	CSR903B-4	ST3M676-4-( )	0.032	0.28	0.50 TO 0.55
	CSR903B-4	ST3M676-4-( )	0.040	0.28	0.50 TO 0.55
	CSR903B-4	ST3M676-4-( )	0.050	0.28	0.50 TO 0.55
	HLT310DL-5-( )	ST3M759V08-( )	0.063	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.071	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.080	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.090	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.100	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759C08-( )	0.125	0.35	0.62 TO 0.68
	HLT50YB-6-( )	ST3M759C3-( )	0.160	0.41	0.75 TO 0.83
	HLT50YB-8-( )	ST3M759C4-( )	0.190 	0.53	1.00 TO 1.12
FLUSH 	BRFS( )T( )	ST3M748T-4( )	0.040	0.28	0.50 TO 0.55
	BRFS( )T( )	ST3M748T-4( )	0.050	0.28	0.50 TO 0.55
	HLT311DL-5-( )	ST3M758V08-( )	0.063	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.071	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.080	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.090	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.100	0.35	0.62 TO 0.68
	HLT311DL-5-( )	ST3M758V08-( )	0.125	0.35	0.62 TO 0.68
	HLT51YB-6-( )	ST3M758C3-( )	0.160	0.41	0.75 TO 0.83
	HLT51YB-8-( )	ST3M758C4-( )	0.190 	0.53	1.00 TO 1.12



TABLE 3. ALUMINUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING




BLIND FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
PROTRUDING	_____	NAS1398C-(4) A ( )	0.020	0.28	0.50 TO 0.55
	_____	NAS1398C-(4) A ( )	0.025 	0.28	0.50 TO 0.55
	_____	NAS1398C-(4) A ( )	0.032	0.28	0.50 TO 0.55
	_____	NAS1398C-(4) A ( )	0.040	0.28	0.50 TO 0.55
	_____	NAS1398C-(4) A ( )	0.050	0.28	0.50 TO 0.55
	_____	MS90354-05-( )	0.060	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.071	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.080	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.090	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.100	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.125	0.35	0.62 TO 0.68
	_____	MS90354-06-( )	0.160	0.41	0.75 TO 0.83
	_____	MS90354-08-( )	0.190 	0.53	1.00 TO 1.12
FLUSH	PLT1058-5-( )	ST3M781-08-( )	0.063	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.071	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.080	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.090	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.100	0.35	0.62 TO 0.68
	_____	MS90353-05-( )	0.125	0.35	0.62 TO 0.68
	_____	MS90353-06-( )	0.160	0.41	0.75 TO 0.83
	_____	MS90353-08-( )	0.190 	0.53	1.00 TO 1.12

TABLE 4. ALUMINUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING TO BE USED IN OR NEAR INLETS




STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
PROTRUDING	_____	MS20470AD-4-( )	0.012	0.28	0.50 TO 0.55
	_____	MS20470AD-4-( )	0.020	0.28	0.50 TO 0.55
	_____	MS20470AD-4-( )	0.025 	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.032	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.040	0.28	0.50 TO 0.55
	CSR903B-( )-( )	ST3M676-4-( )	0.050	0.28	0.50 TO 0.55
	_____	NAS2605V( )	0.063	0.35	0.62 TO 0.68
	_____	NAS1605V( )	0.071	0.35	0.62 TO 0.68
	_____	NAS2605V( )	0.080	0.35	0.62 TO 0.68
	_____	NAS2605V( )	0.090	0.35	0.62 TO 0.68
	_____	NAS2605V( )	0.100	0.35	0.62 TO 0.68
	2605MU( )	ST3M512-5-( )	0.125	0.35	0.62 TO 0.68
	2606MU( )	ST3M512-6-( )	0.160	0.41	0.75 TO 0.83
	2608MU( )	ST3M512-8-( )	0.190 	0.53	1.00 TO 1.12
FLUSH	BRFS( )T( )	ST3M748T-4-( )	0.040	0.28	0.50 TO 0.55
	BRFS( )T( )	ST3M748T-4-( )	0.050	0.28	0.50 TO 0.55
	_____	NAS2705V( )	0.063	0.35	0.62 TO 0.68
	_____	NAS2705V( )	0.071	0.35	0.62 TO 0.68
	_____	NAS2705V( )	0.080	0.35	0.62 TO 0.68
	_____	NAS2705V( )	0.090	0.35	0.62 TO 0.68
	_____	NAS2705V( )	0.100	0.35	0.62 TO 0.68
	2705MU( )	ST3M512-5-( )	0.125	0.35	0.62 TO 0.68
	2706MU( )	ST3M512-6-( )	0.160	0.41	0.75 TO 0.83
	2708MU( )	ST3M512-8-( )	0.190 	0.53	1.00 TO 1.12

Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 10)

TABLE 5. ALUMINUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING TO BE USED IN OR NEAR INLETS

		12 19 BLIND FASTENERS			
		MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH		NAS1399C4A( )	0.063	0.28	0.50 TO 0.55
		NAS1399C4A( )	0.071	0.28	0.50 TO 0.55
		NAS1399C5A( )	0.080	0.35	0.62 TO 0.68
		NAS1399C5A( )	0.090	0.35	0.62 TO 0.68
		NAS1399C6A( )	0.100	0.41	0.75 TO 0.83
		NAS1399C6A( )	0.125	0.41	0.75 TO 0.83
		NAS1399C8A( )	0.160	0.53	1.00 TO 1.12
PROTRUDING		NAS1399C8A( )	0.190 7	0.53	1.00 TO 1.12
		NAS1398C-4A( )	0.012	0.28	0.50 TO 0.55
		NAS1398C-4A( )	0.020	0.28	0.50 TO 0.55
		NAS1398C-4A( )	0.025 5	0.28	0.50 TO 0.55
		NAS1398C-4A( )	0.032	0.28	0.50 TO 0.55
		NAS1398C-4A( )	0.040	0.28	0.50 TO 0.55
		NAS1398C-4A( )	0.050	0.28	0.50 TO 0.55
		NAS1398C-5A( )	0.063	0.35	0.62 TO 0.68
		NAS1398C-5A( )	0.071	0.35	0.62 TO 0.68
		NAS1398C-5A( )	0.080	0.35	0.62 TO 0.68
		NAS1398C-5A( )	0.090	0.35	0.62 TO 0.68
		NAS1398C-5A( )	0.100	0.35	0.62 TO 0.68
		NAS1398C-5A( )	0.125	0.35	0.62 TO 0.68
		NAS1398C-6A( )	0.160	0.41	0.75 TO 0.83
		NAS1398C-8A( )	0.190 7	0.53	1.00 TO 1.12

TABLE 6. TITANIUM MATERIAL

EXISTING MATERIAL	THICKNESS	REPAIR MATERIAL
6AL-4V TITANIUM ANNEALED	0.012 THRU 0.071	6AL-4V TITANIUM ANNEALED

TABLE 7. TITANIUM MATERIAL THICKNESS

EXISTING GAGE (DAMAGED)	REPAIR GAGE
0.012 TO 0.020	0.020
0.024 TO 0.025	0.025
0.026 TO 0.032	0.032
0.040	0.040
0.050	0.050
0.056 TO 0.063	0.063
0.071	0.071

TABLE 8. TITANIUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING





STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
PROTRUDING	CSR903B-5-( )	ST3M676-5-( )	0.020	0.35	0.62 TO 0.68
	CSR903B-5-( )	ST3M676-5-( )	0.025	0.35	0.62 TO 0.68
	CSR903B-6-( )	ST3M676-6-( )	0.032	0.41	0.75 TO 0.83
	HLT310DL-5-( )	ST3M759V08-( )	0.040	0.35	0.62 TO 0.68
	HLT310DL-5-( )	ST3M759V08-( )	0.050	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759C08-( )	0.063	0.35	0.62 TO 0.68
	HLT50YB-5-( )	ST3M759C08-( )	0.071 	0.35	0.62 TO 0.68
FLUSH	BRFS( )T( )	ST3M748T5-( )	0.050	0.35	0.62 TO 0.68
	HLT51YB-5-( )	ST3M758C08-( )	0.063	0.35	0.62 TO 0.68
	HLT51YB-5-( )	ST3M758C08-( )	0.071 	0.35	0.62 TO 0.68
BLIND FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
PROTRUDING	PLT270-5-( )	ST3M790-08-( )	0.020	0.35	0.62 TO 0.68
	PLT270-5-( )	ST3M790-08-( )	0.025	0.35	0.62 TO 0.68
	PLT270-5-( )	ST3M790-3-( )	0.032	0.41	0.75 TO 0.83
	_____	MS90354-05-( )	0.040	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.050	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.063	0.35	0.62 TO 0.68
	_____	MS90354-05-( )	0.071 	0.35	0.62 TO 0.68
FLUSH	PLT1058-5-( )	ST3M781-08-( )	0.063	0.35	0.62 TO 0.68
	PLT1058-5-( )	ST3M781-08-( )	0.071 	0.35	0.62 TO 0.68

TABLE 9. TITANIUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING TO BE USED IN OR NEAR INLETS

12 STANDARD FASTENERS					
	VENDOR NO.	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH {	BRFS( )T( )	ST3M748T5-( )	0.050	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-5-( )	0.063	0.35	0.62 TO 0.68
	2705MU-( )	ST3M509-5-( )	0.071 8	0.35	0.62 TO 0.68
PROTRUDING {	CSR903B-( )-( )	ST3M676-5-( )	0.012	0.35	0.62 TO 0.68
	CSR903B-( )-( )	ST3M676-5-( )	0.020	0.35	0.62 TO 0.68
	CSR903B-( )-( )	ST3M676-5-( )	0.025	0.35	0.62 TO 0.68
	CSR903B-( )-( )	ST3M676-6-( )	0.032	0.41	0.75 TO 0.83
	_____	NAS2605V( )	0.040	0.35	0.62 TO 0.68
	_____	NAS2605V( )	0.050	0.35	0.62 TO 0.68
	2605MU( )	ST3M512-5-( )	0.063	0.35	0.62 TO 0.68
	2605MU( )	ST3M512-5-( )	0.071 8	0.35	0.62 TO 0.68

TABLE 10. TITANIUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE, AND SPACING TO BE USED IN OR NEAR INLETS

12 19 BLIND FASTENERS				
	MCDONNELL NO.	MATERIAL THICKNESS	EDGE DISTANCE	SPACING
FLUSH {	NAS1399C4A( )	0.063	0.28	0.50 TO 0.55
	NAS1399C4A( )	0.071 8	0.28	0.50 TO 0.55
PROTRUDING {	NAS1398C-4A( )	0.012	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.020	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.025	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.032	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.040	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.050	0.28	0.50 TO 0.55
	NAS1398C-4A( )	0.063	0.35	0.62 TO 0.68
	NAS1398C-4A( )	0.071 8	0.35	0.62 TO 0.68

TABLE 11. ALUMINUM MATERIAL THICKNESS

EXISTING GAGE (DAMAGED)	REPAIR GAGE
0.012	0.012
0.013 TO 0.020	0.020
0.026 TO 0.032	0.020
0.033 TO 0.040	0.020
0.041 TO 0.050	0.025
0.051 TO 0.063	0.032
0.064 TO 0.071	0.040
0.072 TO 0.080	0.040
0.081 TO 0.090	0.050
0.091 TO 0.100	0.050
0.101 TO 0.125	0.063
0.126 TO 0.160	0.080
0.161 TO 0.190	0.100
0.191 AND UP	NO REPAIRS ALLOWED

TABLE 12. TITANIUM MATERIAL THICKNESS

EXISTING GAGE (DAMAGED)	REPAIR GAGE
0.012 TO 0.020	0.020
0.024 TO 0.025	0.020
0.026 TO 0.032	0.020
0.040	0.020
0.050	0.025
0.056 TO 0.063	0.032
0.071	0.040

## LEGEND

1. WHEN MAKING REPAIRS THAT AFFECT EXISTING FASTENERS, CONSULT LOCAL ENGINEERING FOR REPLACEMENT FASTENERS.
- 2 ADD A MINIMUM OF FOUR FASTENERS ON EACH SIDE OF DAMAGE.
- 3 INSTALL AS MANY FASTENERS PER WIDTH AS ORIGINAL FLANGE.
- 4 IF FASTENERS FALL IN RADIUS OF REPAIR ANGLE, INSTALL A RADIUS FILLER FOR EACH FASTENER.
- 5 ALUMINUM SHEET, 0.025 INCH THICK IS NOT USED FOR FORMED STRUCTURE.
- 6 THESE REPAIRS APPLY TO TITANIUM PARTS, WHEN USED WITH TABLES 6, 7, 8, 9 AND 10.
- 7 SHEET METAL REPAIRS ARE NOT ALLOWED ON ALUMINUM MATERIAL MORE THAN 0.190 INCH THICK.
- 8 FOR REPAIRS ON TITANIUM MATERIAL GREATER THAN 0.071 INCH THICK, CONSULT LOCAL ENGINEERING FOR DISPOSITION.
- 9 REFER TO TABLE 1 FOR TYPE OF ALUMINUM MATERIALS, TABLE 2 FOR MATERIAL GAGE, TABLE 3 FOR FASTENER SELECTION, EDGE DISTANCE AND SPACING, AND TABLES 4 AND 5 FOR FASTENER SELECTION IN OR NEAR INLETS.
- 10 REFER TO TABLE 6 FOR TYPE OF TITANIUM MATERIAL, TABLE 7 FOR MATERIAL GAGE, TABLE 8 FOR FASTENER SELECTION, EDGE DISTANCE AND SPACING, AND TABLES 9 AND 10 FOR FASTENER SELECTION IN OR NEAR INLETS.
- 11 USE 7075-T6 FOR THICKNESS UP TO AND INCLUDING 0.080 INCH THICK. USE 7075-T76 FOR THICKNESS ABOVE 0.080 INCH THICK.
- 12 BLIND FASTENERS ARE ALLOWED IN OR NEAR INLETS ONLY IF FASTENER HOLE INTERIOR IS NOT ACCESSABLE AND A BLIND FASTENER IS THE ONLY ALTERNATE SEE TABLES 5 AND 10.
- 13 DELETED.
- 14 REFER TO TABLE 1 FOR TYPE OF ALUMINUM MATERIALS, TABLE 11 FOR MATERIAL GAGE, TABLE 3 FOR FASTENER SELECTION, EDGE DISTANCE AND SPACING, AND TABLES 4 AND 5 FOR FASTENER SELECTION IN OR NEAR INLETS.
- 15 REFER TO TABLE 6 FOR TYPE OF TITANIUM MATERIAL, TABLE 12 FOR MATERIAL GAGE, TABLE 8 FOR FASTENER SELECTION, EDGE DISTANCE AND SPACING, AND TABLES 9 AND 10 FOR FASTENER SELECTION IN OR NEAR INLETS.
- 16 FLANGE ON REPAIR STRAP MAY BE FORMED OR AN EXTRUSION, A REPAIR ANGLE MAY BE TRIMMED TO THE CONFIGURATION SHOWN IN VIEW J.
- 17 FLANGE ON REPAIR STRAP MAY BE ORIENTED ON EITHER THE INSIDE OR OUTSIDE OF STIFFENER.
- 18 REFER TO TABLE 3 FOR ALUMINUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE AND SPACING, AND TABLE 8 FOR TITANIUM MATERIAL THICKNESS, FASTENER SELECTION, EDGE DISTANCE AND SPACING.
- 19 EACH HOLE MUST BE GRIP GAGED TO DETERMINE CORRECT LENGTH. INSTALL BLIND FASTENERS WET WITH MIL-S-83430 (A1-F18AC-SRM-200, WP 011 00).
- 20 ONLY ONE FASTENER HOLE MAY BE REPLACED BY REPAIR FILLER.

Figure 1. Aluminum and Titanium Sheet, Formed Structure (Sheet 15)

ORGANIZATIONAL MAINTENANCE

STRUCTURE REPAIR

TYPICAL REPAIR

ALUMINUM SHEET EDGE REPAIR

Reference Material

Structure Repair, General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application .....	WP011 00

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Record of Applicable Technical Directives

None

1. PROCEDURE.

through 5, as required.

2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to its stress intensity and repair zones. For stress intensity diagram and repair zones, refer to the applicable structure repair manual in which the part is shown. For method of repair refer to figures 1 through 5 and tables 1

Support Equipment Required

None

Materials Required

None

Table 1. Repair Material Selection




Existing Material	Thickness	Repair Material
2024-T6	0.080 or less	7075-T6
6061  1 7050  1 7075  1	More than 0.080	7075-T76
2024-T72	All	2024-T72



Table 1. Repair Material Selection (Continued)

Existing Material	Thickness	Repair Material
NOTE		
<div>1</div> Existing material 6061, 7050, and 7075 may be any temper.		





Table 2. Repair Material Thickness Selection

Existing Thickness (Damaged) <div>1</div>	Repair Thickness
0.020 or less	0.020
0.021 to 0.025	0.025
0.026 to 0.032	0.032
0.033 to 0.040	0.040
0.041 to 0.050	0.050
0.051 to 0.063	0.063
0.064 to 0.071	0.071
0.072 to 0.080	0.080
0.081 to 0.090	0.090
0.091 to 0.100	0.100
0.101 to 0.125	0.125
More than 0.125	<div>2</div>
NOTE	
<div>1</div> Repair thickness selection is based on land thickness of damaged part.	
<div>2</div> Repair requires engineering disposition.	




Table 3. Fastener Selection For Aluminum Repairs In Areas Other Than Inlets

Existing Thickness (Damaged) <div>1</div>	Standard Fastener		Blind Fastener	
	Flush <div>2</div>	Protruding	Flush <div>2</div>	Protruding
0.020 or Less	BRFS4AD( )	MS20470AD4-( )	PLT1058-5-( )	NAS1398C-(4)A( )
0.021 to 0.025	BRFS4AD( )	MS20470AD4-( )	PLT1058-5-( )	NAS1398C-(4)A( )
0.026 to 0.032	BRFS4T( )	CSR9038-4-( )	PLT1058-5-( )	NAS1398C-(4)A( )
0.033 to 0.040	BRFS4T( )	CSR9038-4-( )	PLT1058-5-( )	NAS1398C-(4)A( )
0.041 to 0.050	BRFS4T( )	CSR9038-4-( )	PLT1058-5-( )	NAS1398C-(4)A( )
0.051 to 0.063	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.064 to 0.071	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.072 to 0.080	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.081 to 0.090	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.091 to 0.100	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.101 to 0.125	HLT51DL-5-( )	HLT50DL-5-( )	MS90353-05( )	MS90354-05( )
NOTE				
<div>1</div> Fastener selection is based on bay thickness of damaged part.				




**Table 3. Fastener Selection For Aluminum Repairs In Areas Other Than Inlets (Continued)**

Existing Thickness (Damaged)  1	Standard Fastener		Blind Fastener	
	Flush  2	Protruding	Flush  2	Protruding
 2 When using below listed fasteners it is possible to countersink too deep. Minimum material thickness required for these fasteners is:				
<b>Fastener</b>	<b>Minimum Material Thickness</b>			
BRFS4AD( )	0.033			
BRFS4T-( )	0.033			
HLT311DL-5-( )	0.057			
PLT1058-5-( )	0.057			

**Table 4. Fastener Selection For Aluminum Repairs In Inlet Areas**

Existing Thickness (Damaged)  1	 2 Standard Fastener	
	Flush  3	Protruding
0.020 or Less	BRFS4AD( )	MS20470AD4-( )
0.021 to 0.025	BRFS4AD( )	MS20470AD4-( )
0.026 to 0.032	BRFS4T( )	CSR9038-4-( )
0.033 to 0.040	BRFS4T( )	CSR9038-4-( )
0.041 to 0.050	BRFS4T( )	CSR9038-4-( )
0.051 to 0.063	NAS2705V( )	NAS2605V( )
0.064 to 0.071	NAS2705V( )	NAS2605V( )
0.072 to 0.080	NAS2705V( )	NAS2605V( )
0.081 to 0.090	NAS2705V( )	NAS2605V( )
0.091 to 0.100	NAS2705V( )	NAS2605V( )
0.101 to 0.125	2705MU-( )	2605MU-( )

**NOTE**

-  1 Fastener selection is based on bay thickness of damaged parts.
-  2 Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate.
-  3 When using below listed fasteners it is possible to countersink too deep. Minimum material thickness for these fasteners is:

<b>Fastener</b>	<b>Minimum Material Thickness</b>
BRFS4AD( )	0.033
BRFS4T-( )	0.033
NAS2705V( )	0.057

Table 5. Fastener Selection For Aluminum Repairs in Inlet Areas.

2 1 BLIND FASTENERS			
FLUSH			
MCDONNELL NO.	3 MATERIAL THICKNESS	EDGE DISTANCE	SPACING
NAS1399C4A( )	0.063	0.28	0.50 To 0.55
NAS1399C4A( )	0.071	0.28	0.50 To 0.55
NAS1399C5A( )	0.080	0.35	0.62 To 0.68
NAS1399C5A( )	0.090	0.35	0.62 To 0.68
NAS1399C6A( )	0.100	0.41	0.75 To 0.83
NAS1399C6A( )	0.125	0.41	0.75 To 0.83
PROTRUDING			
NAS1398C4A( )	0.012	0.28	0.50 To 0.55
NAS1398C4A( )	0.020	0.28	0.50 To 0.55
NAS1398C4A( )	0.025	0.28	0.50 To 0.55
NAS1398C4A( )	0.032	0.28	0.50 To 0.55
NAS1398C4A( )	0.040	0.28	0.50 To 0.55
NAS1398C4A( )	0.050	0.28	0.50 To 0.55
NAS1398C5A( )	0.063	0.35	0.62 To 0.68
NAS1398C5A( )	0.071	0.35	0.62 To 0.68
NAS1398C5A( )	0.080	0.35	0.62 To 0.68
NAS1398C5A( )	0.090	0.35	0.62 To 0.68
NAS1398C5A( )	0.100	0.35	0.62 To 0.68
NAS1398C5A( )	0.125	0.35	0.62 To 0.68
<b>NOTE</b> 1 Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate. 2 Grip gage each hole to determine correct fastener length. Install blind fasteners wet with MIL-S-83430 (A1-F18AC-SRM-200, WP011 00). 3 Based on bay thickness.			

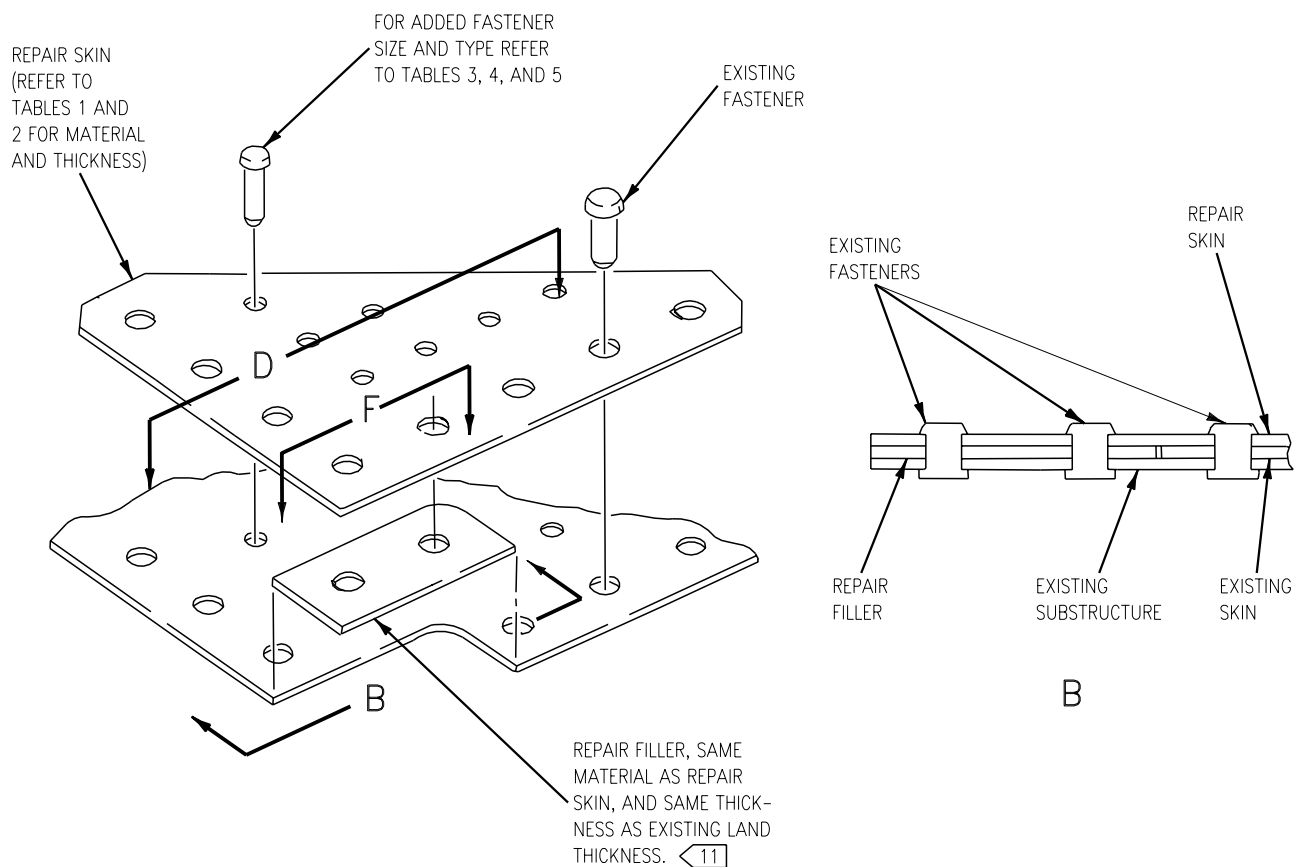
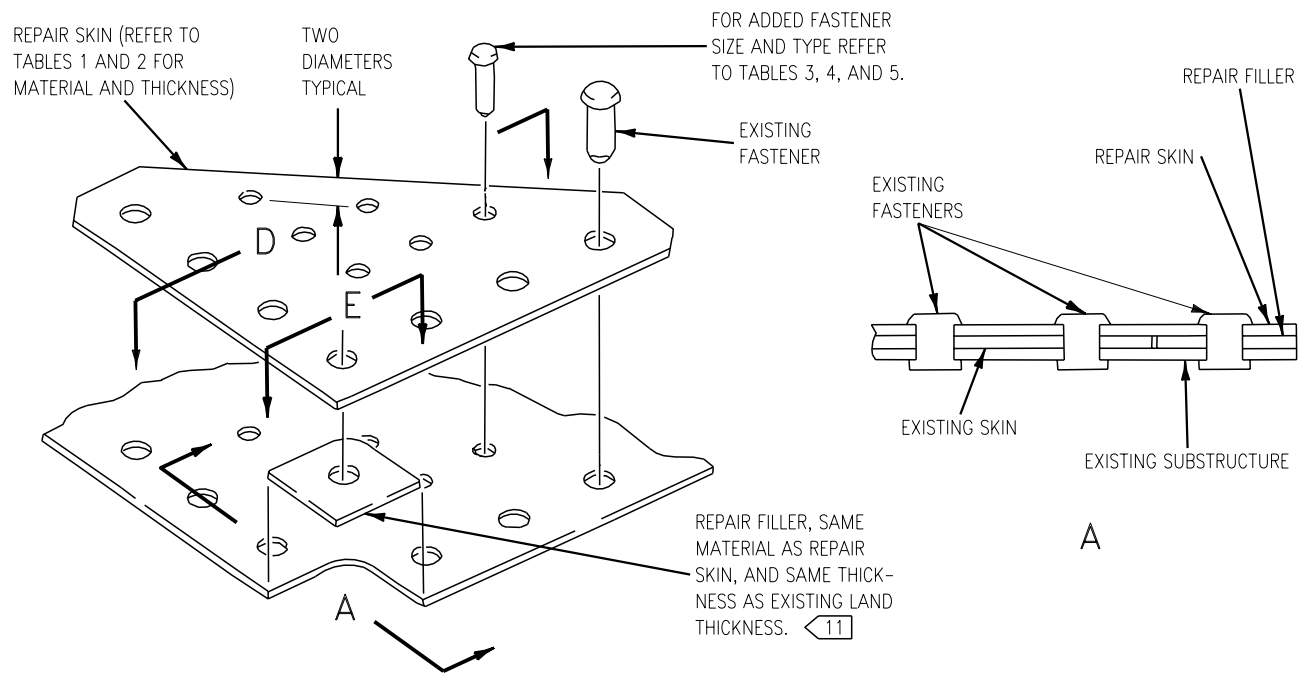


Figure 1. Corner Damage to Lands (Sheet 1)

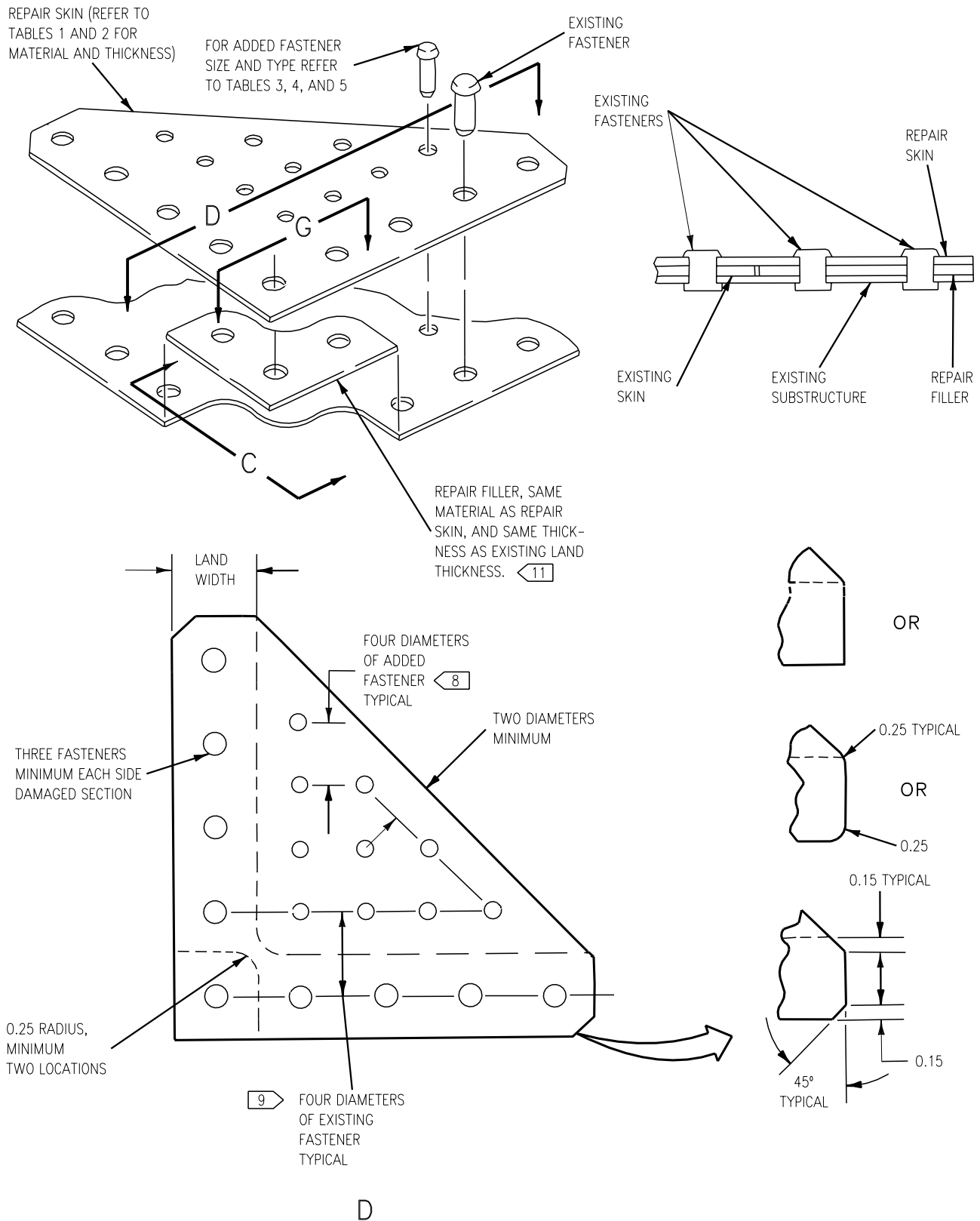
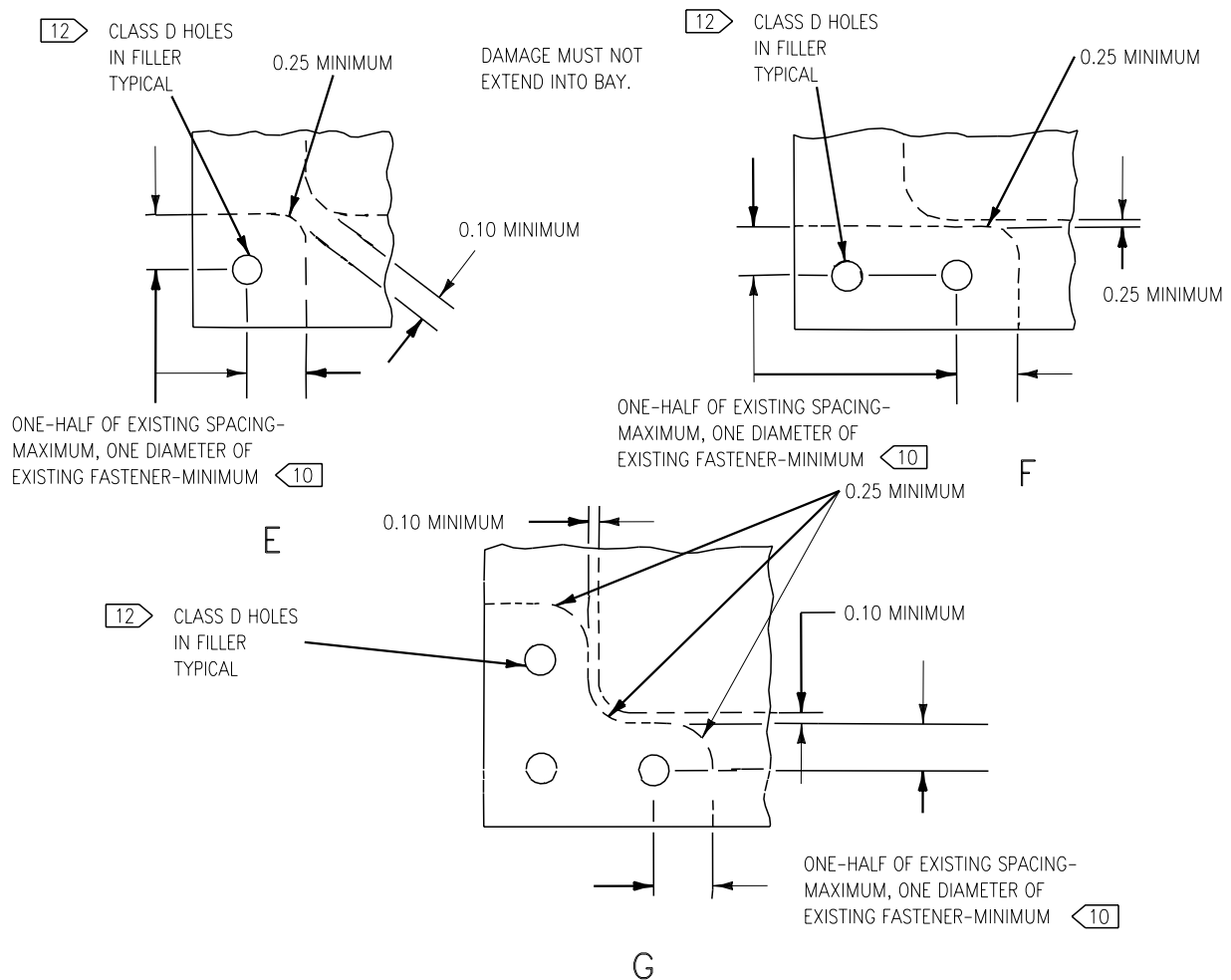


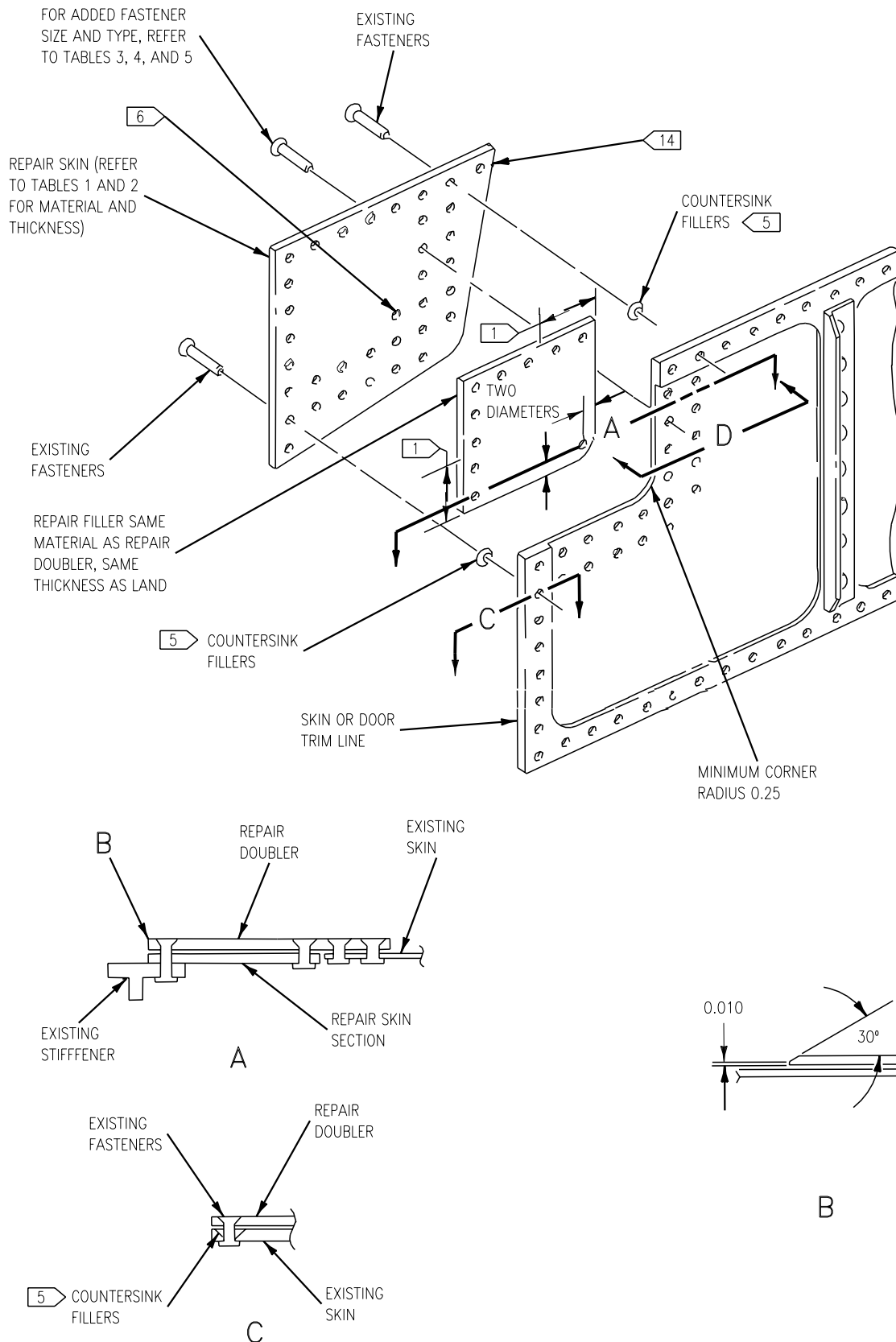
Figure 1. Corner Damage to Lands (Sheet 2)



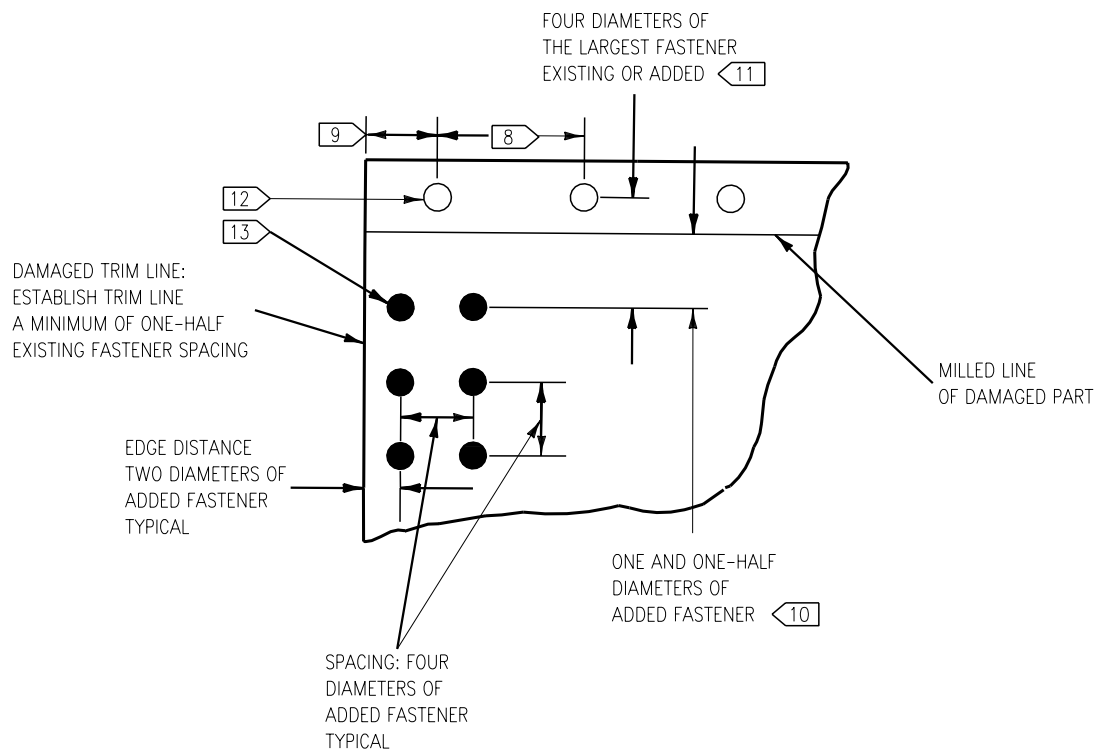
## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
4. ADD COUNTERSINK FILLERS AS REQUIRED.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, OR 5.
7. EXISTING FASTENER MUST BE LARGER THAN ADDED FASTENER, REFER TO TABLES 3, 4, OR 5.
- 8 ADDED FASTENER ROW MUST EXTEND TO OR BEYOND SECOND EXISTING FASTENER FROM DAMAGE TRIM LINE.
- 9 IF FOUR DIAMETERS SPACING LOCATES FASTENER AT LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILL LINE, LOCATE FASTENER AT ONE AND ONE-HALF DIAMETERS.
- 10 CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.
- 11 FOR REPAIRS TO DOORS OR OTHER REMOVABLE STRUCTURE, BOND THE FILLER TO THE REPAIR SKIN USING EA9321 A/B ADHESIVE (A1-F18AC-SRM-200, WPO11 00). DRILL FASTENER HOLES IN FILLER BEFORE BONDING FILLER TO PATCH.
- 12 CLASS D HOLES ARE A LOOSE FIT HOLE, USED IN MOST CASES ON NON STRUCTURAL COMPONENTS.

Figure 1. Corner Damage to Lands (Sheet 3)



**Figure 2. Corner Damage to Lands and Bays (Sheet 1)**



D

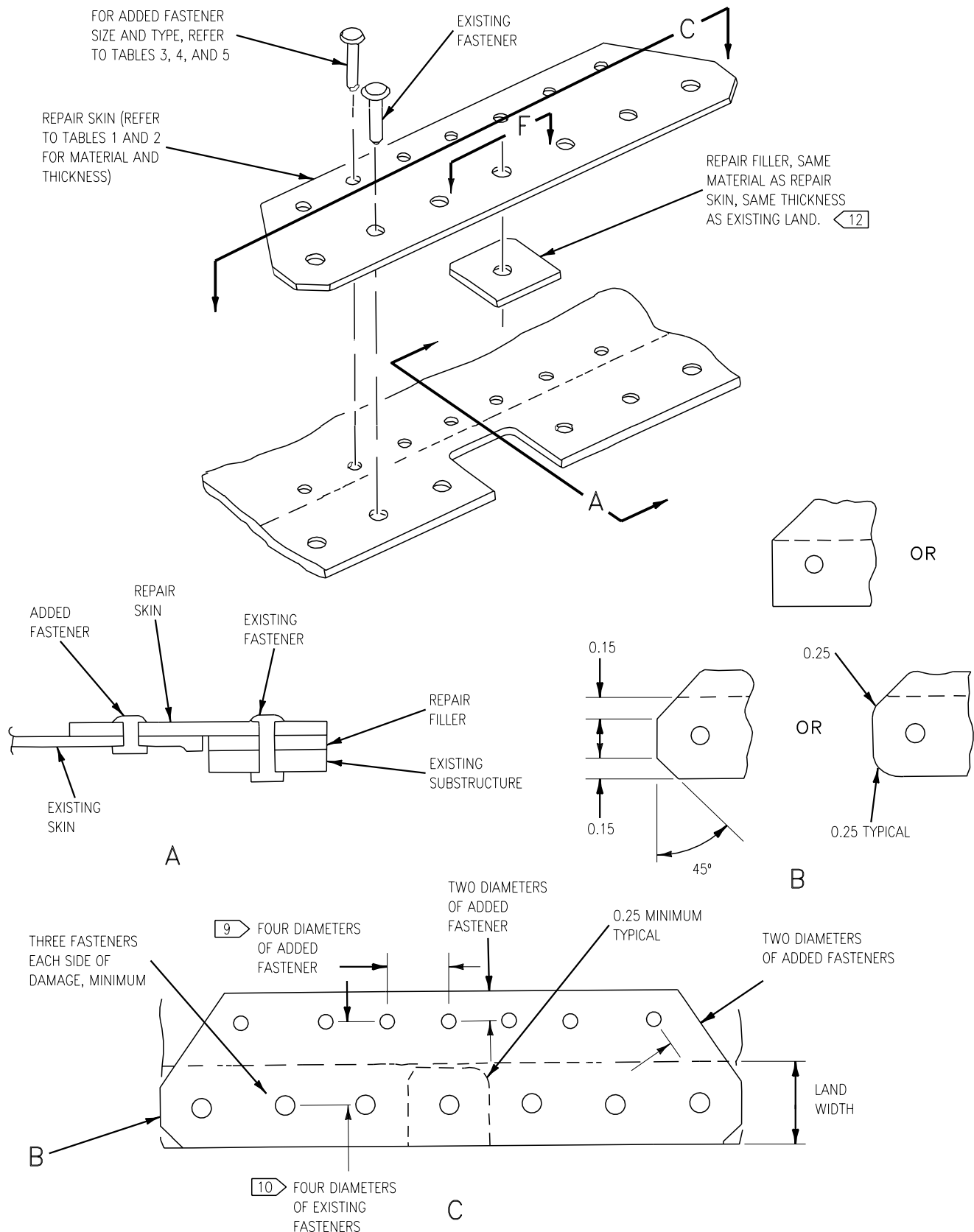
FASTENER SPACING AND  
EDGE DISTANCE TYPICAL.

## LEGEND

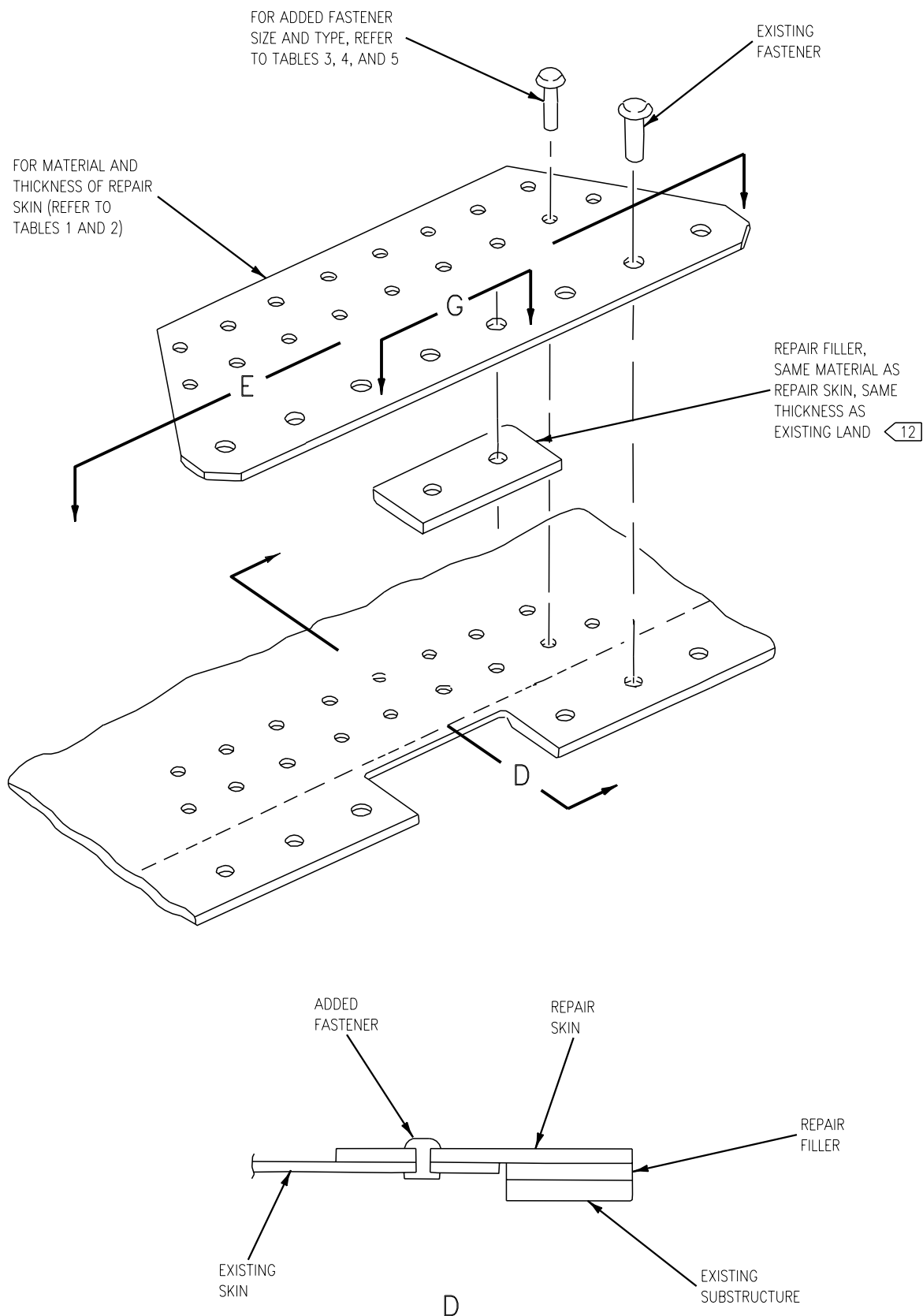
- |  |   |
|--|---|
| <p>1 IF MISMATCH BETWEEN REPAIR FILLER, OR DOUBLER, AND ORIGINAL LAND IS GREATER THAN 0.010 INCH. TAPER REPAIR PART FROM ORIGINAL LAND THICKNESS AT TRIM LINE TO REPAIR PART THICKNESS MIDWAY BETWEEN SECOND AND THIRD FASTENERS FROM TRIM LINE.</p> <p>2. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.</p> <p>3. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.</p> <p>4. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.</p> <p>5 ADD COUNTERSINK FILLERS AS REQUIRED.</p> <p>6 BASIC FASTENERS SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.</p> <p>7. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLE 3, 4, OR 5.</p> | <p>8 EXISTING FASTENER SPACING.</p> <p>9 ONE-HALF EXISTING FASTENER SPACING.</p> <p>10 ALL FASTENERS SHALL BE ALUMINUM AND ONE AND ONE-HALF DIAMETERS FROM MILLED LINE.</p> <p>11 IF FOUR DIAMETERS SPACING LOCATES FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILLED LINE, RELOCATE FASTENER TO COMPLY WITH NOTE TEN.</p> <p>12  -EXISTING FASTENER</p> <p>13  -ADDED FASTENER</p> <p>14 REPAIR DOUBLER TO PICK UP THREE FASTENER HOLES PAST DAMAGE CUTOUT IN LANDS.</p> |
|--|---|

Figure 2. Corner Damage to Lands and Bays (Sheet 2)





**Figure 3. Edge Damage to Lands (Sheet 1)**



**Figure 3. Edge Damage to Lands (Sheet 2)**

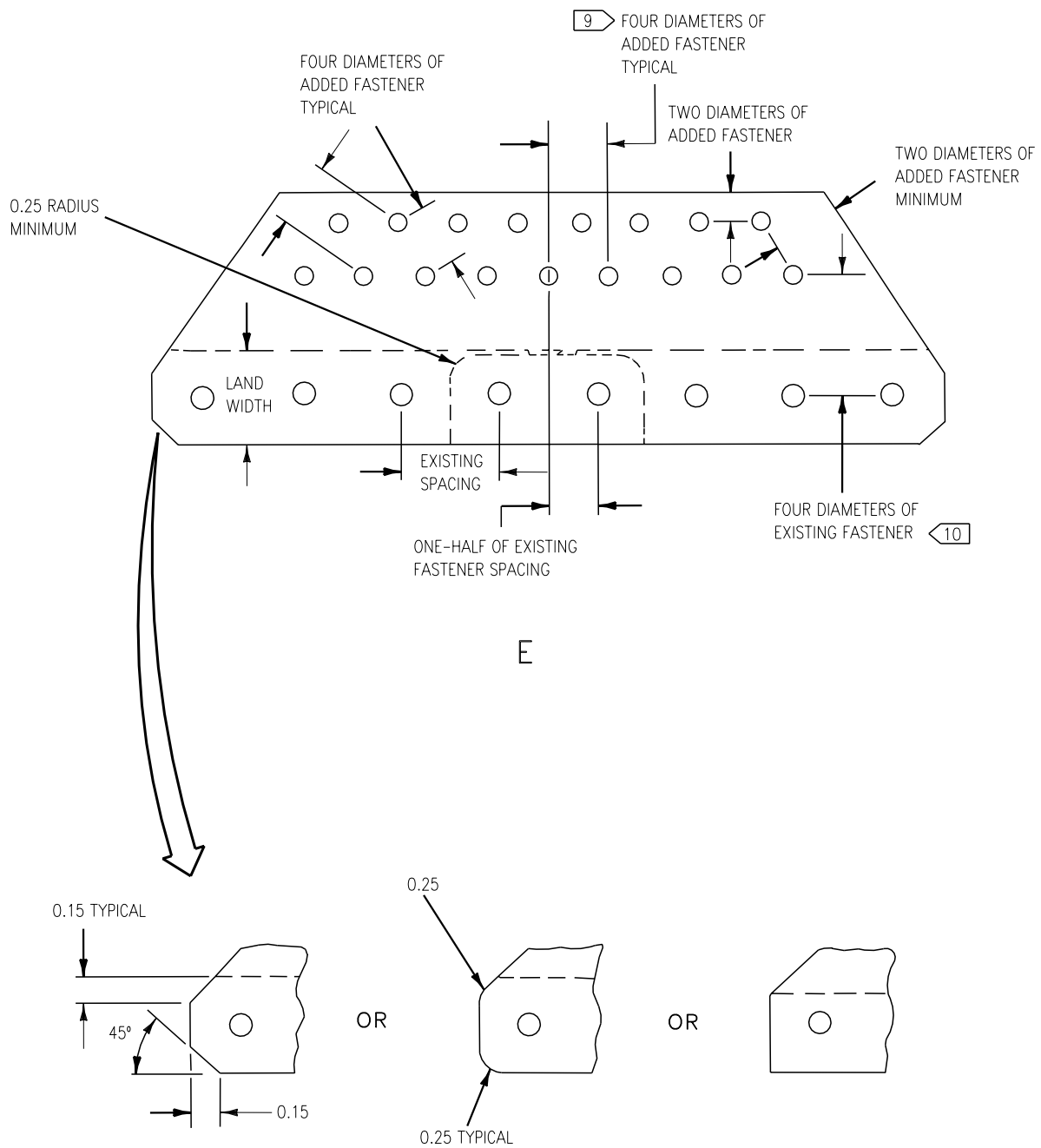
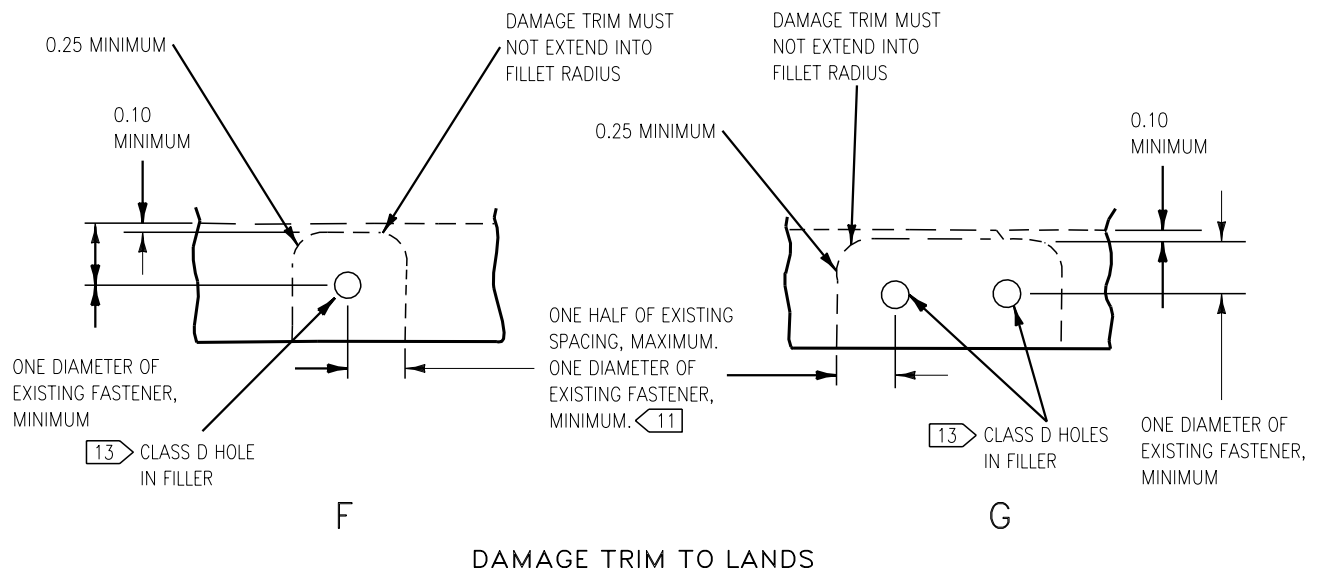


Figure 3. Edge Damage to Lands (Sheet 3)



## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
4. ADD COUNTERSINK FILLERS AS REQUIRED.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, AND 5.
7. EXISTING FASTENER MUST BE LARGER THAN ADDED FASTENER, SEE TABLES 3, 4, AND 5.
8. CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.

9 ADDED FASTENER ROW MUST EXTEND TO OR BEYOND FIRST EXISTING FASTENER FROM DAMAGE TRIM LINE.

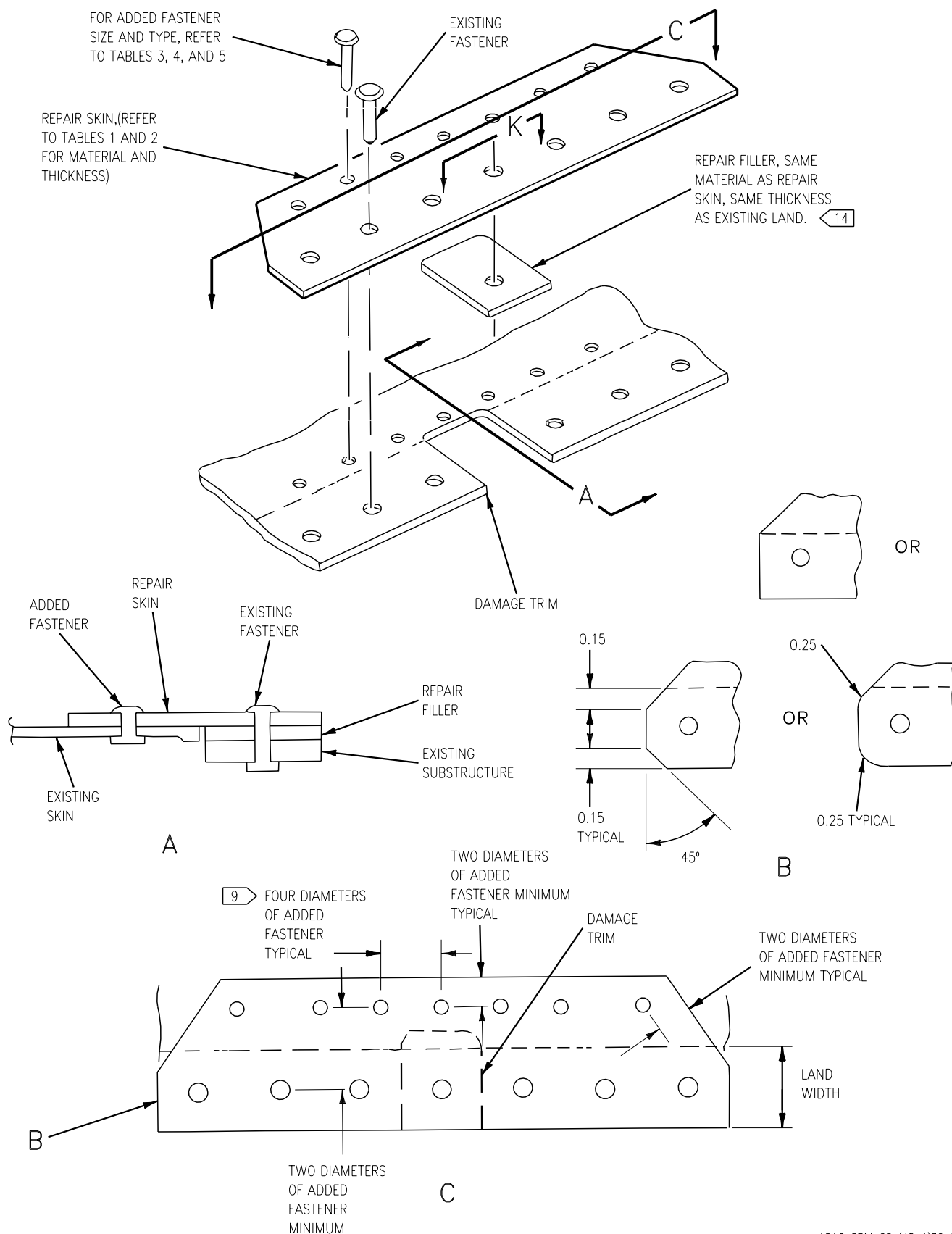
10 IF FOUR DIAMETERS SPACING LOCATES FASTENER AT LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILL LINE, LOCATE FASTENER AT ONE AND ONE-HALF DIAMETERS.

11 WITHIN THESE LIMITS, CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.

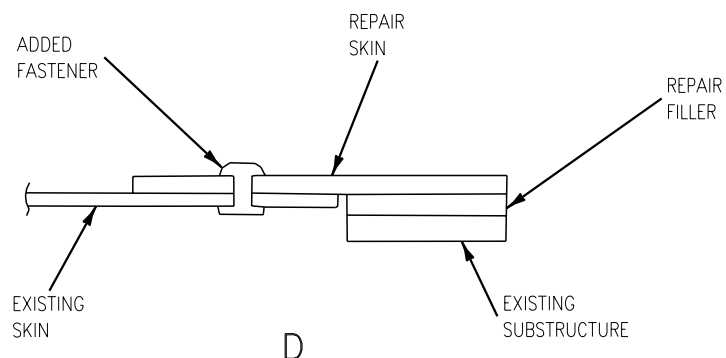
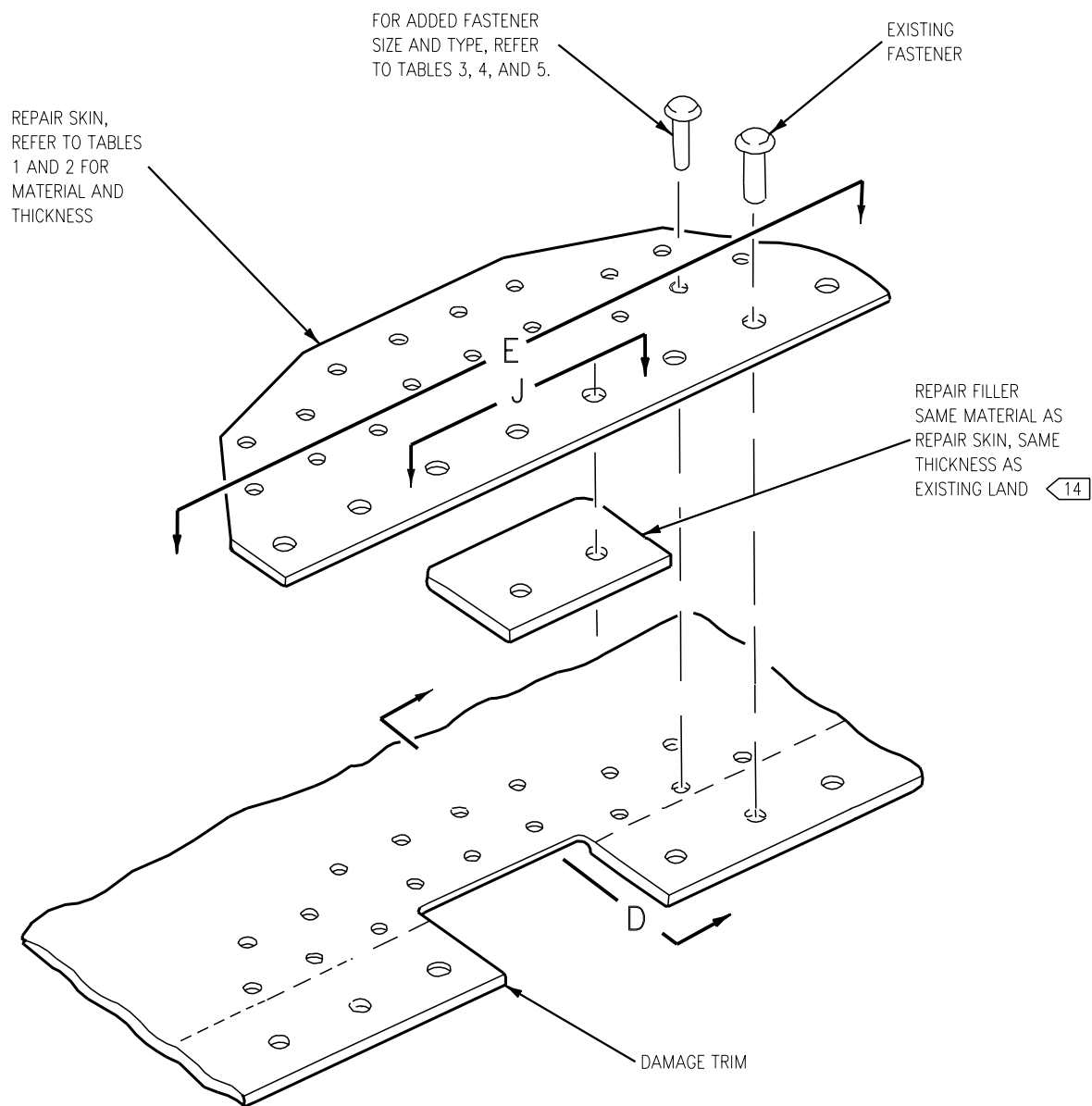
12 FOR REPAIRS TO DOORS OR OTHER REMOVABLE STRUCTURE, BOND THE REPAIR FILLER TO THE PATCH USING EA9321 A/B ADHESIVE (A1-F18AC-SRM-200 WP011 00). DRILL FASTENER HOLES IN FILLER BEFORE BONDING FILLER TO PATCH.

13 CLASS D HOLES ARE A LOOSE FIT HOLE, USED IN MOST CASES ON NON STRUCTURAL COMPONENTS.

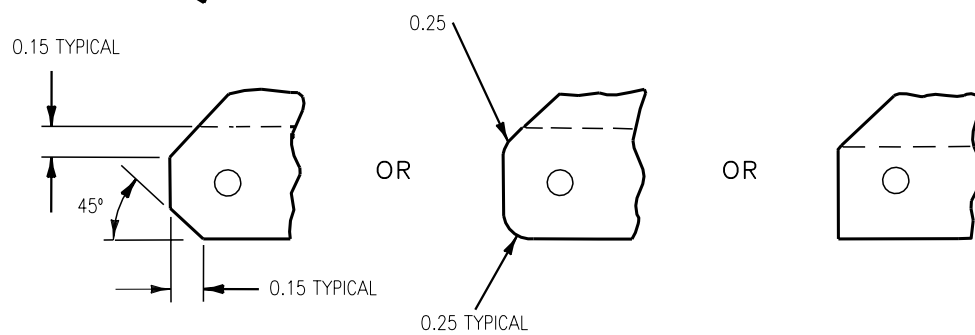
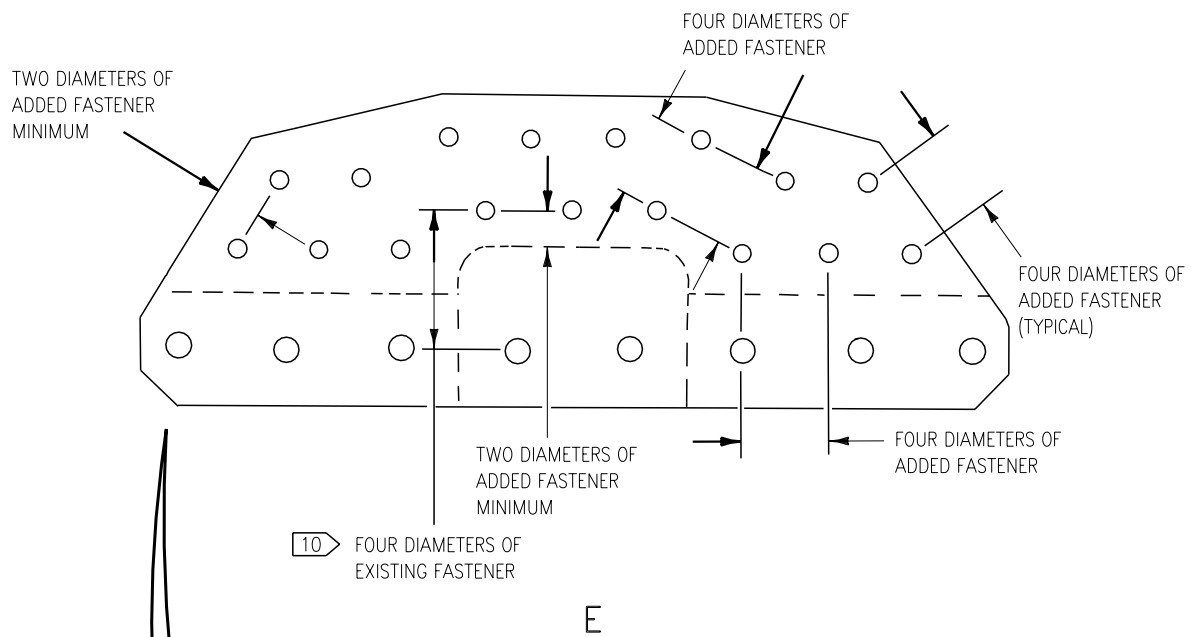
Figure 3. Edge Damage to Lands (Sheet 4)



**Figure 4. Edge Damage to Lands and Bays (Sheet 1)**



**Figure 4. Edge Damage to Lands and Bays (Sheet 2)**



**Figure 4. Edge Damage to Lands and Bays (Sheet 3)**

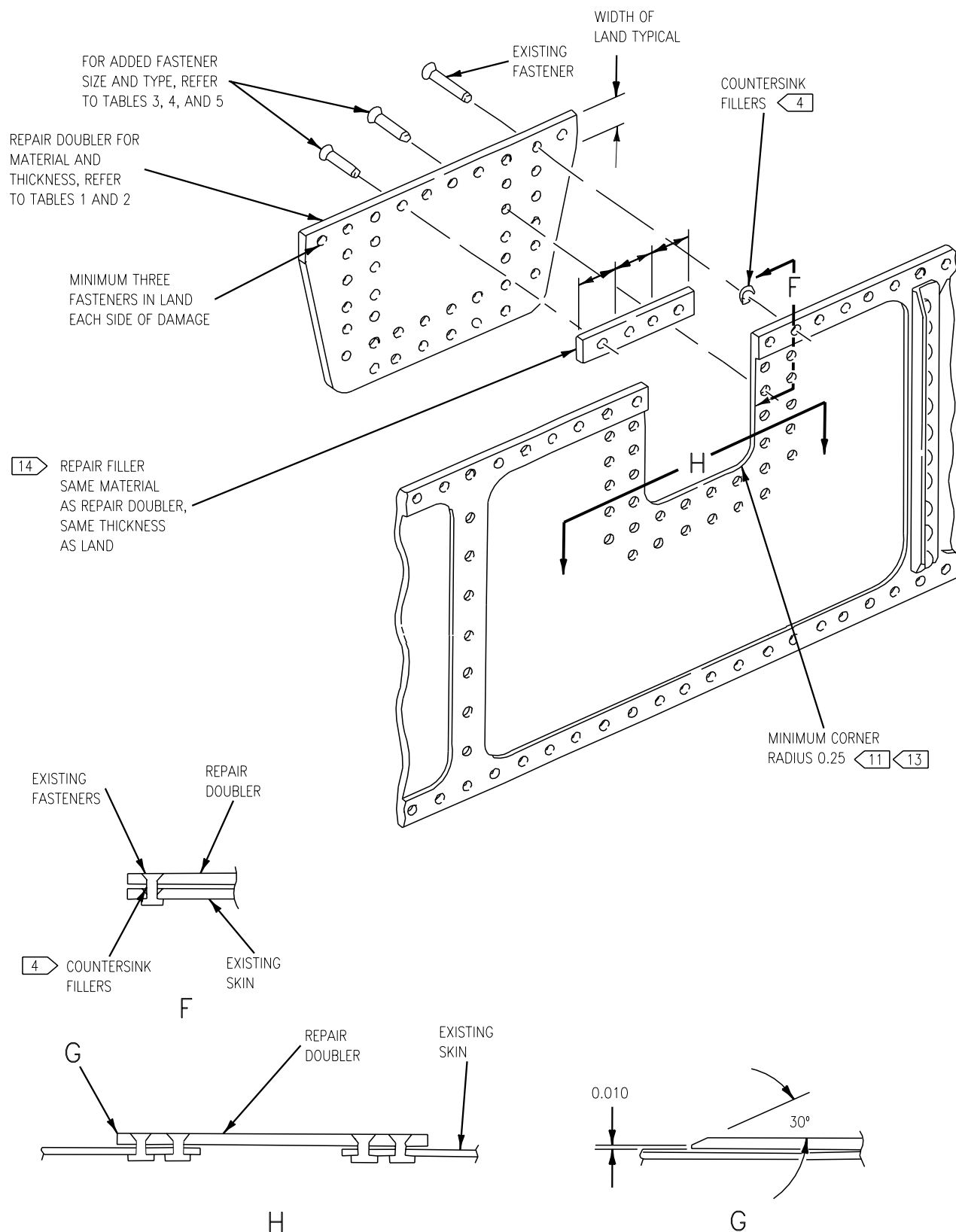
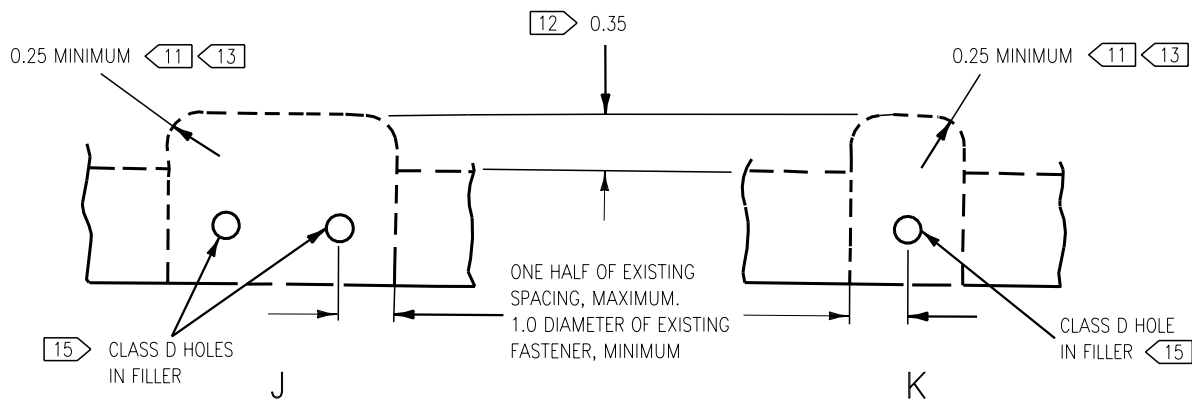


Figure 4. Edge Damage to Lands and Bays (Sheet 4)



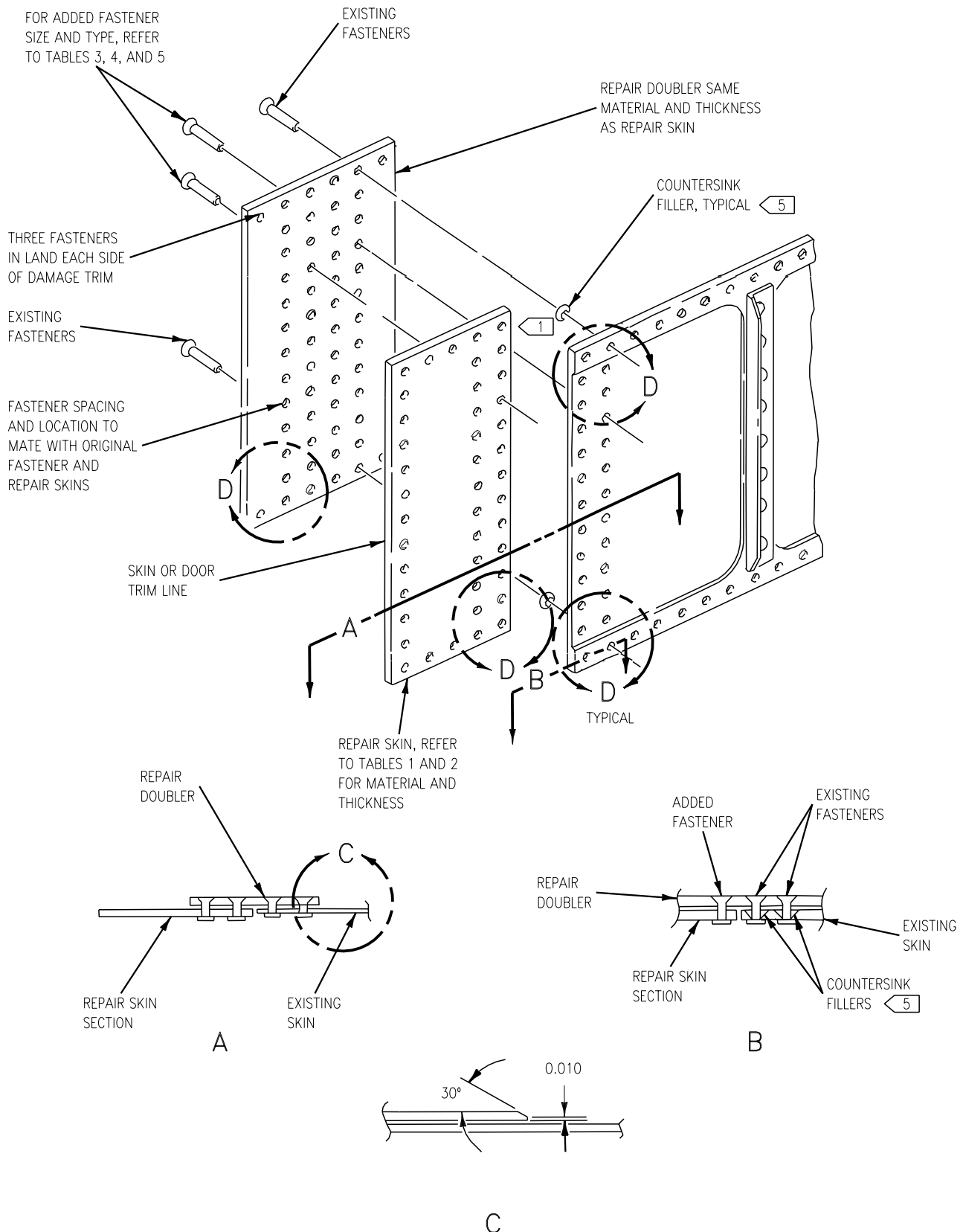


## DAMAGE TRIM TO LANDS AND BAY

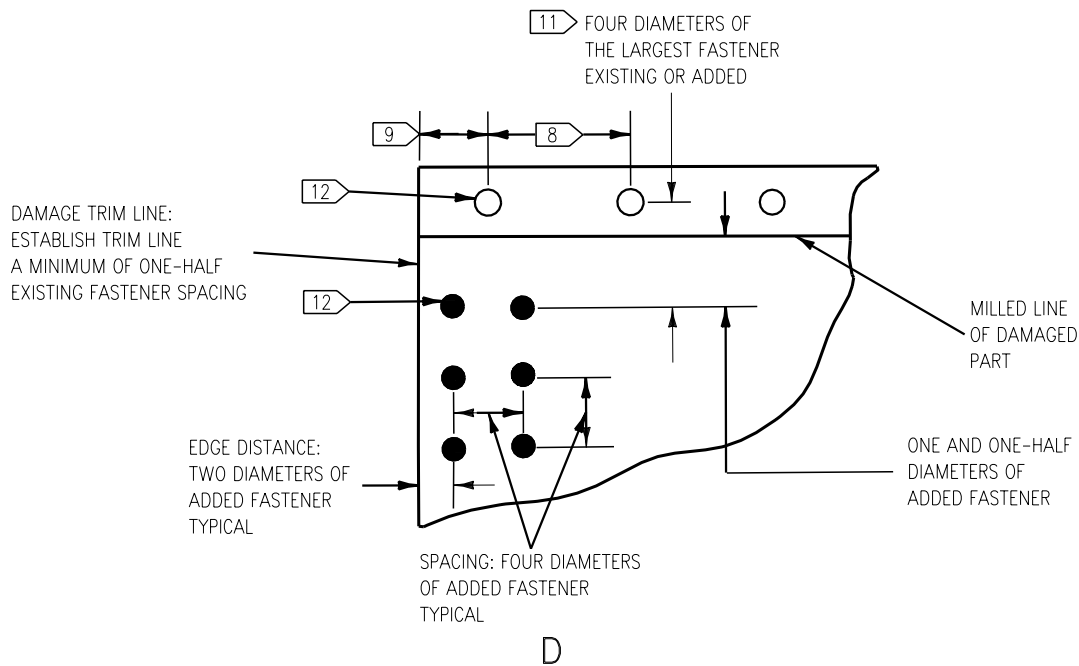
## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
- 4 ADD COMPLETELY COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS FILL COUNTERSINK AND ARE FLUSH WITH MOLDLINE.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS FOR EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, AND 5.
7. EXISTING FASTENER MUST BE LARGER THAN ADDED FASTENER, SEE TABLES 3, 4, AND 5.
8. CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.
- 9 ADDED FASTENER ROW MUST EXTEND TO OR BEYOND SECOND EXISTING FASTENER FROM DAMAGE TRIM LINE.
- 10 IF FOUR DIAMETERS SPACING LOCATES FASTENER AT LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILL LINE, LOCATE FASTENER AT ONE AND ONE-HALF DIAMETERS.
- 11 WITHIN THESE LIMITS, CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.
- 12 ALL DAMAGE EXTENDING INTO BAY SHALL BE TRIMMED BACK 0.35 INCH FROM MILLED FILLET. IF DAMAGE EXTENDS MORE THAN 0.35 INTO BAY, USE REPAIR ON SHEET 4.
- 13 TRIM RADIUS MUST NOT INTERSECT WITH MILLED FILLET.
- 14 FOR REPAIR TO DOORS OR OTHER REMOVABLE STRUCTURE, BOND THE REPAIR FILLER TO THE REPAIR PATCH USING EA9321 A/B ADHESIVE (A1-F18AC-SRM-200, WP011 00). DRILL FASTENER HOLES IN FILLER BEFORE BONDING FILLER.
- 15 CLASS D HOLES ARE A LOOSE FIT HOLE, USED IN MOST CASES ON NON STRUCTURAL COMPONENTS.

Figure 4. Edge Damage to Lands and Bays (Sheet 5)



**Figure 5. Full Width Damage to End (Sheet 1)**



## LEGEND

- 1 IF MISMATCH BETWEEN REPAIR FILLER, OR DOUBLER, AND ORIGINAL LAND IS GREATER THAN 0.010 INCH, TAPER REPAIR PART FROM ORIGINAL LAND THICKNESS AT TRIM LINE TO REPAIR PART THICKNESS MIDWAY BETWEEN SECOND AND THIRD FASTENERS FROM TRIM LINE.
2. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
3. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
4. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
- 5 ADD COUNTERSINK FILLERS AS REQUIRED.
6. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
- 7 SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, OR 5.
- 8 EXISTING FASTENER SPACING.
- 9 ONE-HALF EXISTING FASTENER SPACING.
- 10 ALL FASTENERS SHALL BE ALUMINUM AND ONE AND ONE-HALF DIAMETERS FROM ANY MILLED LINE.
- 11 IF FOUR DIAMETERS SPACING LOCATES FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILLED LINE, RELOCATE FASTENER TO COMPLY WITH NOTE TEN.
- 12 ○ - EXISTING FASTENER  
● - ADDED FASTENER

Figure 5. Full Width Damage to End (Sheet 2)

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## TITANIUM SHEET EDGE REPAIR

## Reference Material

Structure Repair, General Information ..... A1-F18AC-SRM-200  
 Adhesive, Cement, and Sealant; Preparation and Application ..... WP011 00

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## Record of Applicable Technical Directives

None

## 1. PROCEDURE.

required.

2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to its stress intensity and repair zones. For stress intensity diagram and repair zones, refer to applicable structure repair manual in which part is shown. For method of repair, refer to figures 1 through 5 and tables 1 through 5, as

## Support Equipment Required

None

## Materials Required

None

Table 1. Repair Material Selection

Existing Material	Thickness	Repair Material
6AL-4V Ti	All	6AL-4V Ti

Table 2. Repair Material Thickness Selection

Existing Thickness (Damaged) <input type="text" value="1"/>	Repair Thickness
0.020 or Less	0.020
0.021 to 0.025	0.025
0.026 to 0.032	0.032
0.033 to 0.040	0.040
0.041 to 0.050	0.050
0.051 to 0.063	0.063
0.064 to 0.071	0.071
0.072 to 0.080	0.080
0.081 to 0.090	0.090
0.091 to 0.100	0.100
0.101 to 0.125	0.125
More than 0.125	<input type="text" value="2"/>

**NOTE**

Repair thickness and selection is based on land thickness of damaged part.

Repair requires engineering disposition.

Table 3. Fastener Selection For Titanium Repairs In Areas Other Than Inlets

Existing Thickness (Damaged) <input type="text" value="1"/>	Standard Fastener		Blind Fastener	
	Flush <input type="text" value="2"/>	Protruding	Flush <input type="text" value="2"/>	Protruding
0.020 or Less	BRFS5T( )	CSR9038-5-( )	PLT1058-5-( )	PLT270-5-( )
0.21 to 0.025	BRFS5T( )	CSR9038-5-( )	PLT1058-5-( )	PLT270-5-( )
0.026 to 0.032	BRFS6T( )	CSR9038-6-( )	PLT1058-5-( )	PLT270-6-( )
0.033 to 0.040	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.041 to 0.050	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.051 to 0.063	HLT51DL-5-( )	HLT50DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.064 to 0.071	HLT51DL-5-( )	HLT50DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.072 to 0.080	HLT51DL-5-( )	HLT50DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.081 to 0.090	HLT51DL-6-( )	HLT50DL-6-( )	PLT1058-6-( )	MS90354-06( )
0.091 to 0.100	HLT51DL-8-( )	HLT50DL-8-( )	PLT1058-8-( )	MS90354-08( )
0.101 to 0.125	HLT51DL-8-( )	HLT50DL-8-( )	PLT1058-8-( )	MS90354-08( )

**NOTE**

Fastener selection is based on bay thickness of damaged parts.

When using below listed fasteners it is possible to countersink too deep. Minimum material thickness required for these fasteners is:

Fastener	Minimum Material Thickness
BRFS5T-( )	0.043
BRFS6T-( )	0.056
HLT311DL-5-( )	0.057
HLT51DL-5-( )	0.057
PLT1058-5-( )	0.057

Table 4. Fastener Selection For Titanium Repairs In Inlet Areas

Existing Thickness (Damaged) ◀ 1	2 ▶ Standard Fastener	
	Flush 3 ▶	Protruding
0.020 or Less	BRFS5T( )	CSR9038-5-( )
0.021 to 0.025	BRFS5T( )	CSR9038-5-( )
0.026 to 0.032	BRFS6T( )	CSR9038-6-( )
0.033 to 0.040	NAS2705V( )	NAS2605V( )
0.041 to 0.050	NAS2705V( )	NAS2605V( )
0.051 to 0.063	2705MU( )	2605MU( )
0.064 to 0.071	2705MU( )	2605MU( )
0.072 to 0.080	2705MU( )	2605MU( )
0.081 to 0.090	2706MU( )	2606MU( )
0.091 to 0.100	2708MU( )	2608MU( )
0.101 to 0.125	2708MU( )	2608MU( )

**NOTE**

- 1 ▶ Fastener selection is based on bay thickness of damaged parts.
- 2 ▶ Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate.
- 3 ▶ When using below listed fasteners it is possible to countersink too deep. Minimum material thickness for these fasteners is:

**Fastener****Minimum Material  
Thickness**

BRFS5T( )	0.043
BRFS6T-( )	0.056
NAS2705V( )	0.057
2705MU-( )	0.057

Table 5. Fastener Selection For Titanium Repairs in Inlet Areas

BLIND FASTENERS <input type="checkbox"/> 1 <input type="checkbox"/> 2			
FLUSH			
MCDONNELL NO.	MATERIAL THICKNESS <input type="checkbox"/> 3	EDGE DISTANCE	SPACING
NAS1399C4A( )	0.063	0.28	0.50 To 0.55
NAS1399C4A( )	0.071	0.28	0.50 To 0.55
NAS1399C5A( )	0.080	0.35	0.62 To 0.68
NAS1399C5A( )	0.090	0.35	0.62 To 0.68
NAS1399C6A( )	0.100	0.41	0.75 To 0.83
NAS1399C6A( )	0.125	0.41	0.75 To 0.83
PROTRUDING			
NAS1398C4A( )	0.012	0.28	0.50 To 0.55
NAS1398C4A( )	0.020	0.28	0.50 To 0.55
NAS1398C4A( )	0.025	0.28	0.50 To 0.55
NAS1398C4A( )	0.032	0.28	0.50 To 0.55
NAS1398C4A( )	0.040	0.28	0.50 To 0.55
NAS1398C4A( )	0.050	0.28	0.50 To 0.55
NAS1398C5A( )	0.063	0.35	0.62 To 0.68
NAS1398C5A( )	0.071	0.35	0.62 To 0.68
NAS1398C5A( )	0.080	0.35	0.62 To 0.68
NAS1398C5A( )	0.090	0.35	0.62 To 0.68
NAS1398C5A( )	0.100	0.35	0.62 To 0.68
NAS1398C5A( )	0.125	0.35	0.62 To 0.68
<b>NOTE</b> <input type="checkbox"/> 1 Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate. <input type="checkbox"/> 2 Grip gage each hole to determine correct fastener length. Install blind fasteners wet with MIL-S-83430 (A1-F18AC-SRM-200, WP011 00). <input type="checkbox"/> 3 Based on bay thickness.			

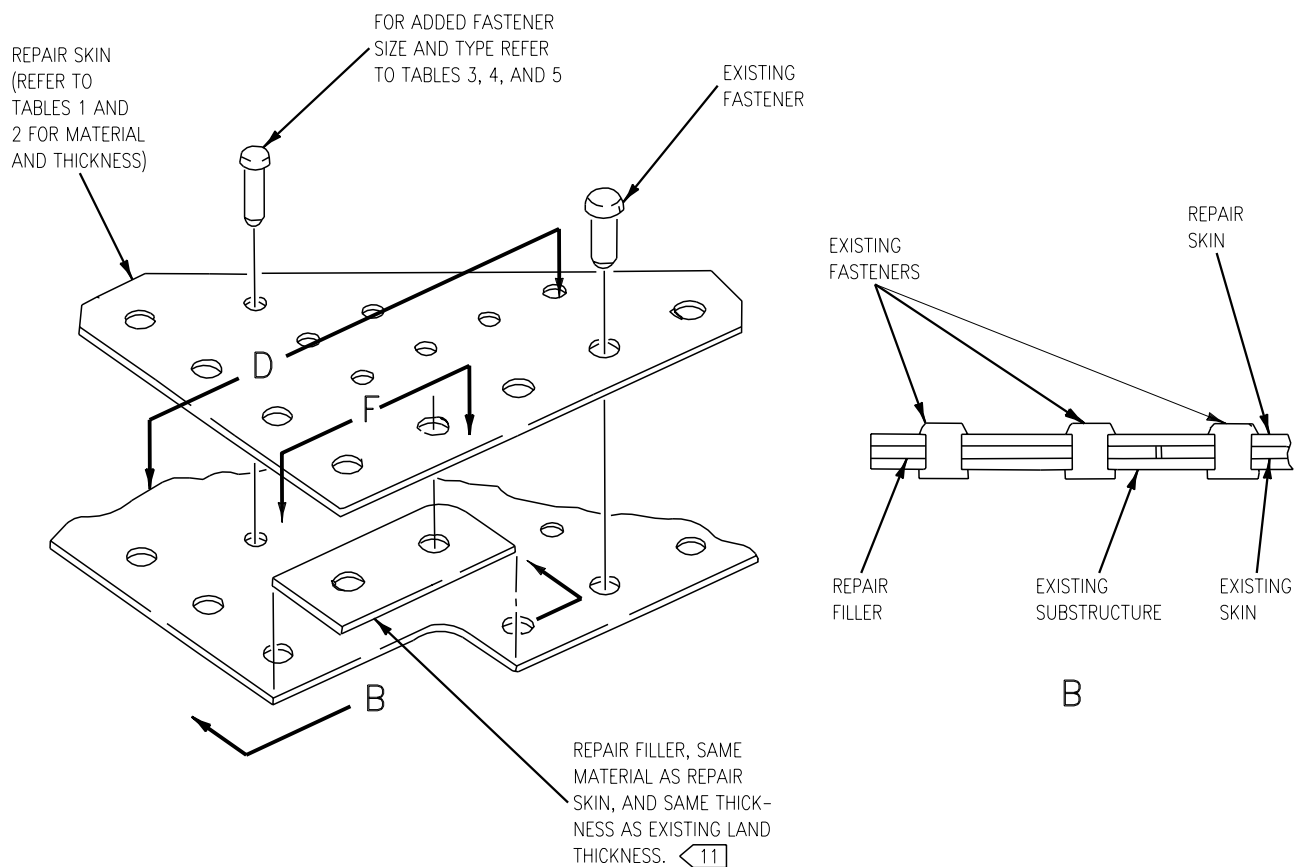
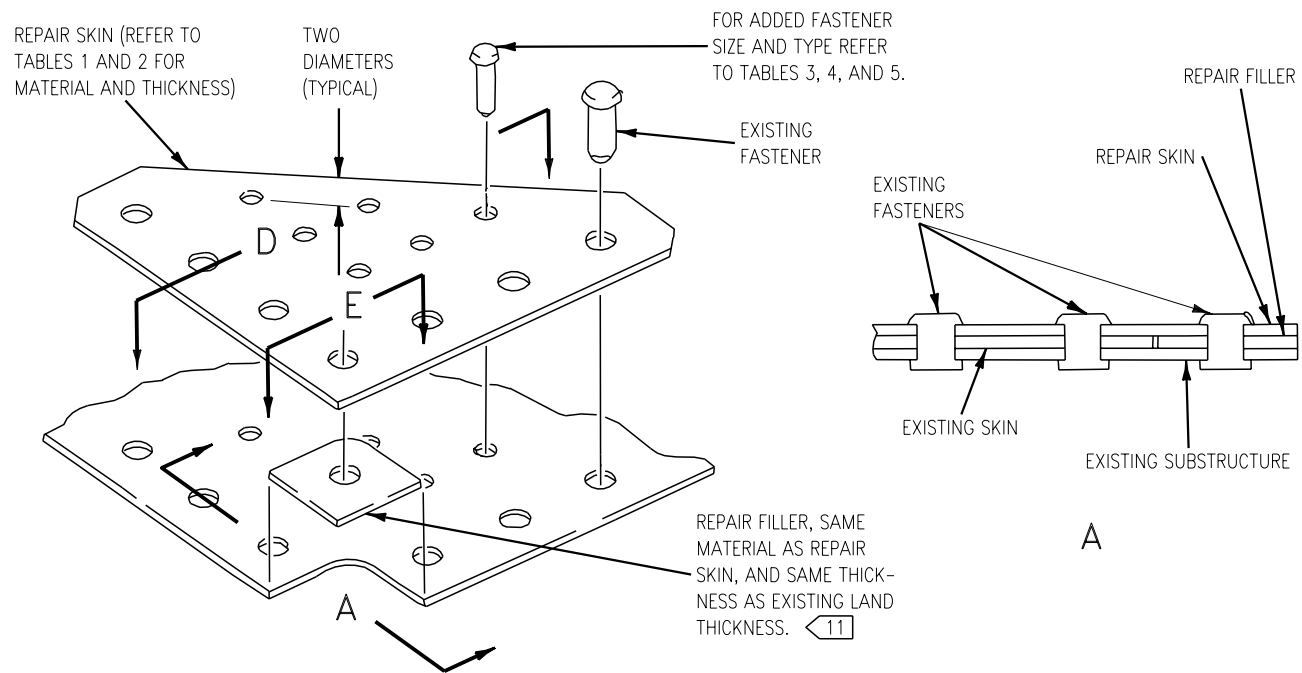


Figure 1. Corner Damage to Lands (Sheet 1)



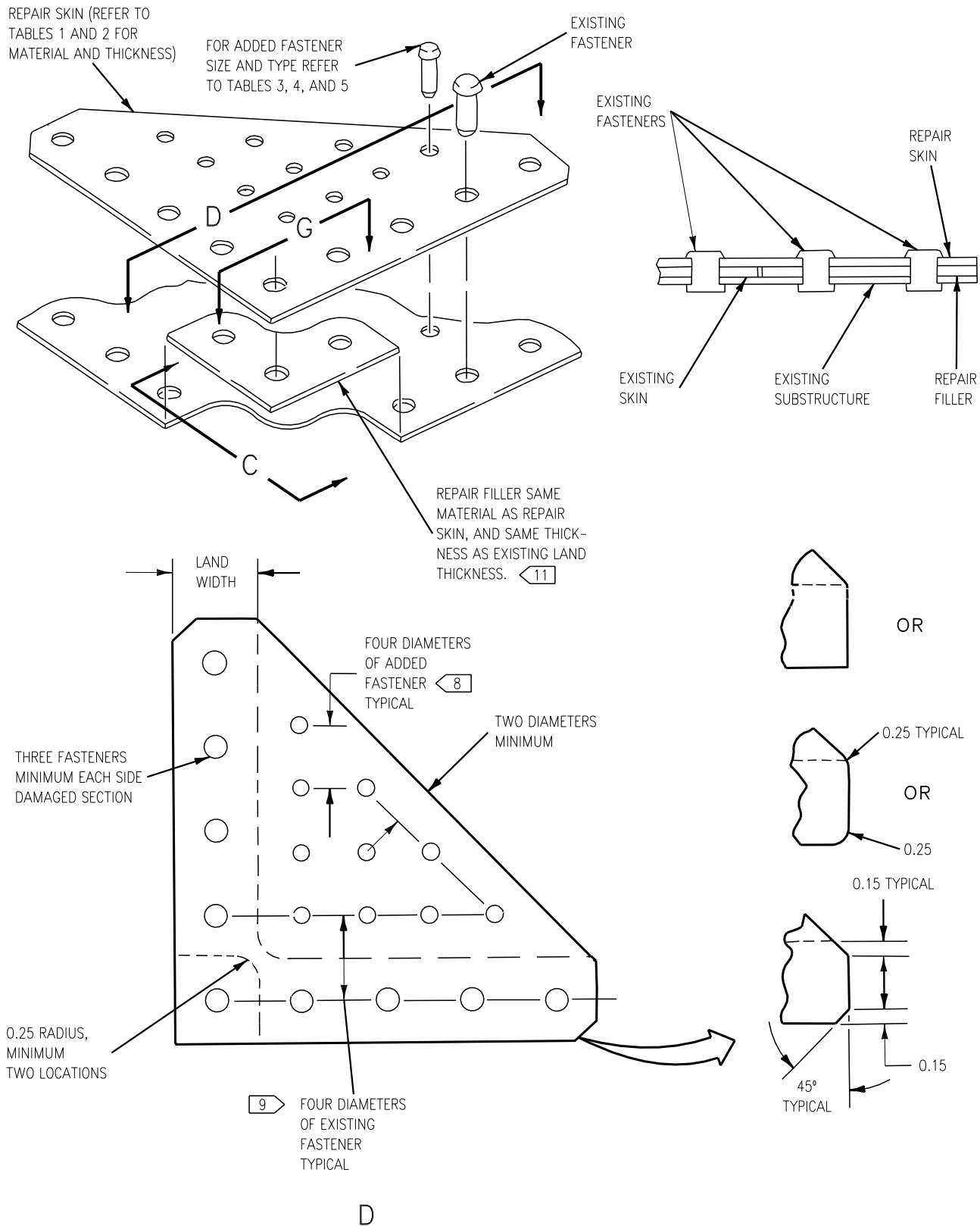
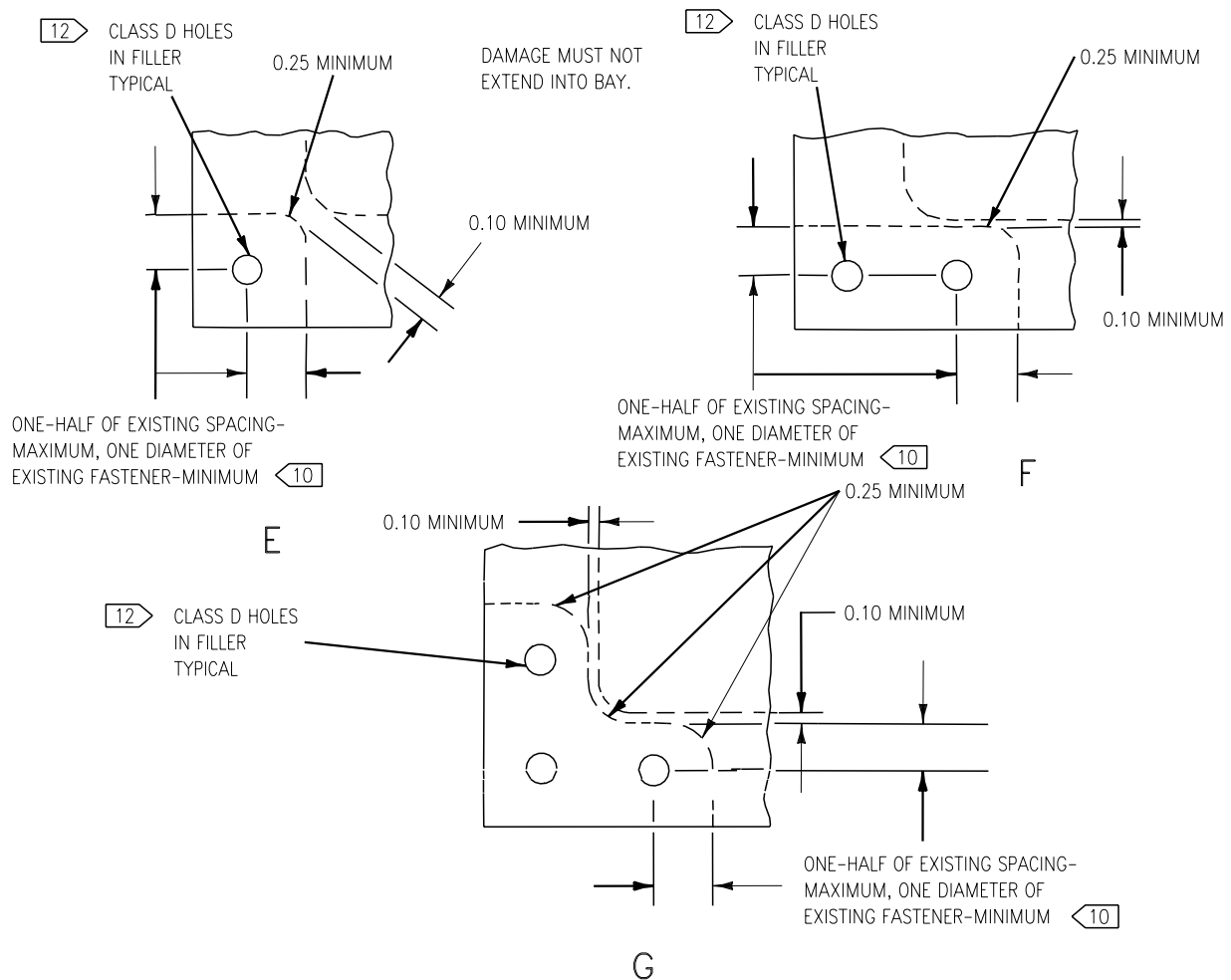


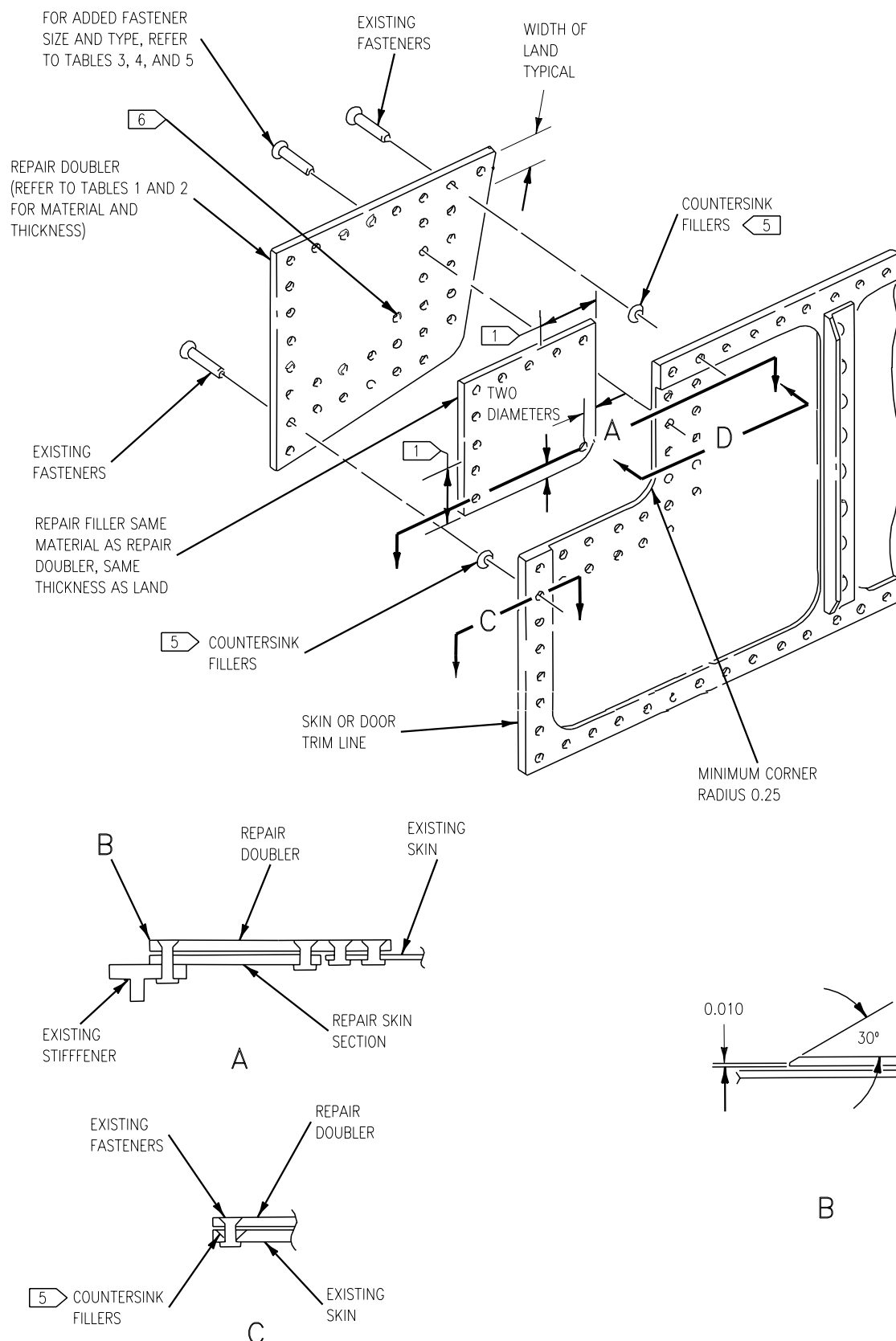
Figure 1. Corner Damage to Lands (Sheet 2)



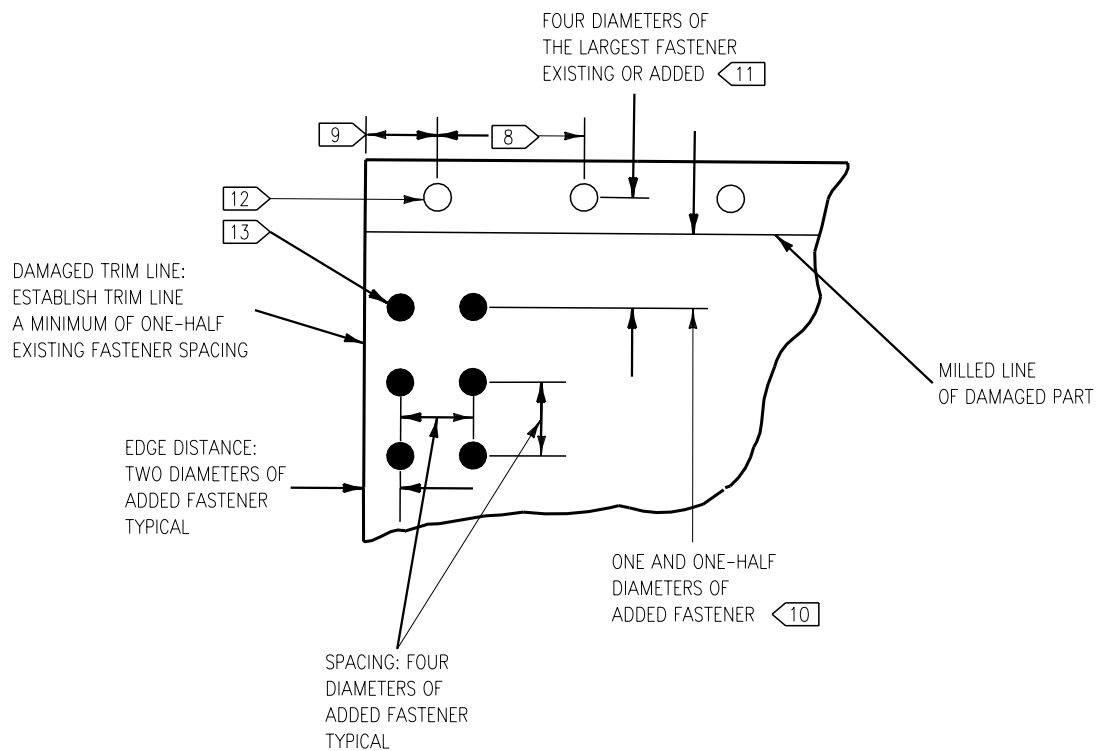
## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
4. ADD COUNTERSINK FILLERS AS REQUIRED.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, OR 5.
7. EXISTING FASTENER MUST BE LARGER THAN ADDED FASTENER, REFER TO TABLES 3, 4, OR 5.
- 8 ADDED FASTENER ROW MUST EXTEND TO OR BEYOND SECOND EXISTING FASTENER FROM DAMAGE TRIM LINE.
- 9 IF FOUR DIAMETERS SPACING LOCATES FASTENER AT LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILL LINE, LOCATE FASTENER AT ONE AND ONE-HALF DIAMETERS.
- 10 CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.
- 11 FOR REPAIRS TO DOORS OR OTHER REMOVABLE STRUCTURE, BOND THE FILLER TO THE REPAIR SKIN USING EA9321 A/B ADHESIVE (A1-F18AC-SRM-200, WPO11 00). DRILL FASTENER HOLES IN FILLER BEFORE BONDING FILLER TO PATCH.
- 12 CLASS D HOLES ARE A LOOSE FIT HOLE, USED IN MOST CASES ON NON STRUCTURAL COMPONENTS.

Figure 1. Corner Damage to Lands (Sheet 3)



**Figure 2. Corner Damage to Lands and Bays (Sheet 1)**



D

FASTENER SPACING AND  
EDGE DISTANCE TYPICAL.

## LEGEND

1 IF MISMATCH BETWEEN REPAIR FILLER, OR DOUBLER AND ORIGINAL LAND IS MORE THAN 0.010 INCH, TAPER REPAIR PART FROM ORIGINAL LAND THICKNESS AT TRIM LINE TO REPAIR PART THICKNESS MIDWAY BETWEEN SECOND AND THIRD FASTENERS FROM TRIM LINE.

2. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.

3. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.

4. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.

5 ADD COUNTERSINK FILLERS AS REQUIRED.

6 BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.

7. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLE 3, 4, OR 5.

8 EXISTING FASTENER SPACING.

9 ONE-HALF EXISTING FASTENER SPACING.

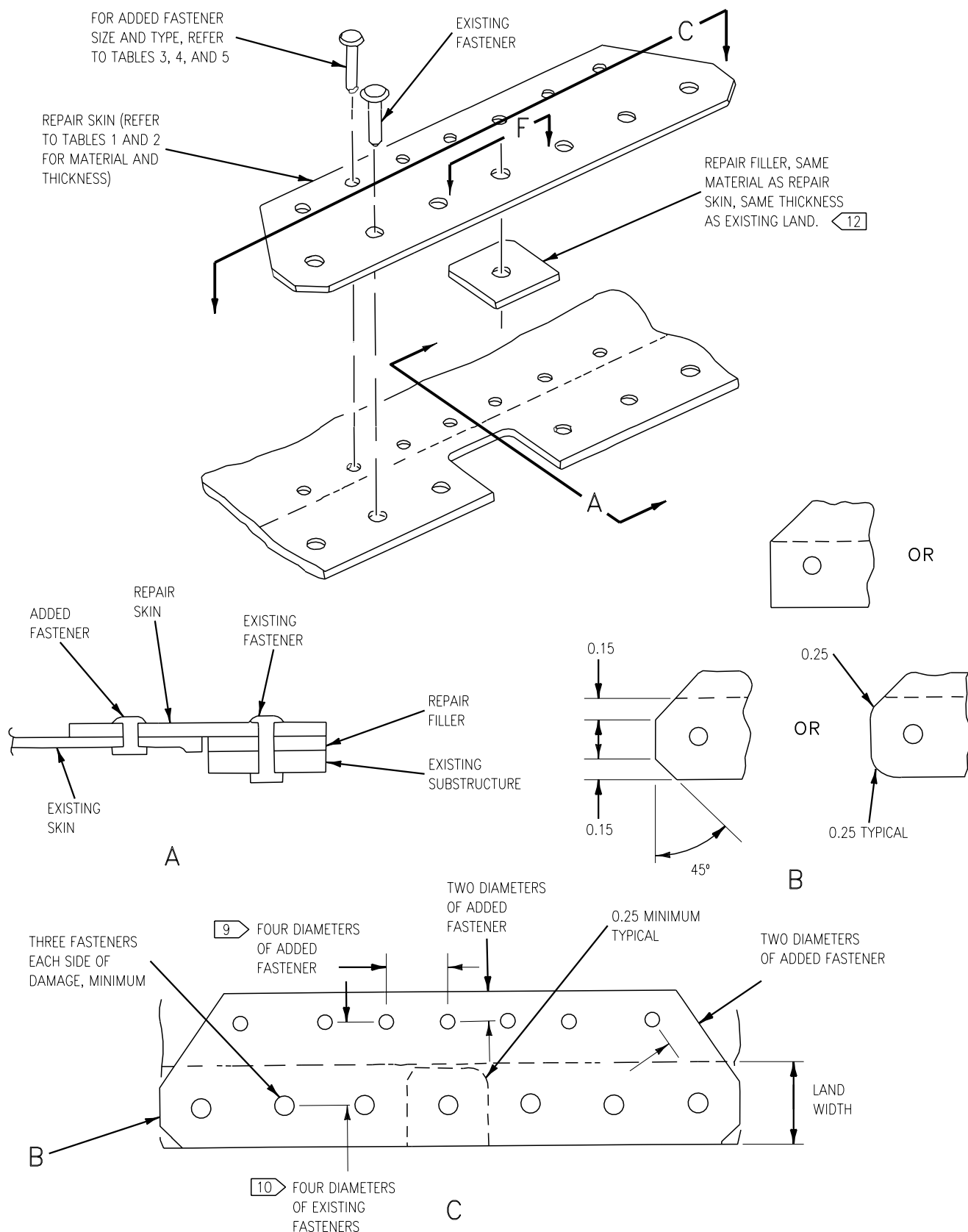
10 ALL FASTENERS SHALL BE ALUMINUM AND ONE AND ONE-HALF DIAMETERS FROM ANY MILLED LINE.

11 IF FOUR DIAMETERS SPACING LOCATES FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILLED LINE, RELOCATE FASTENER TO COMPLY WITH NOTE TEN.

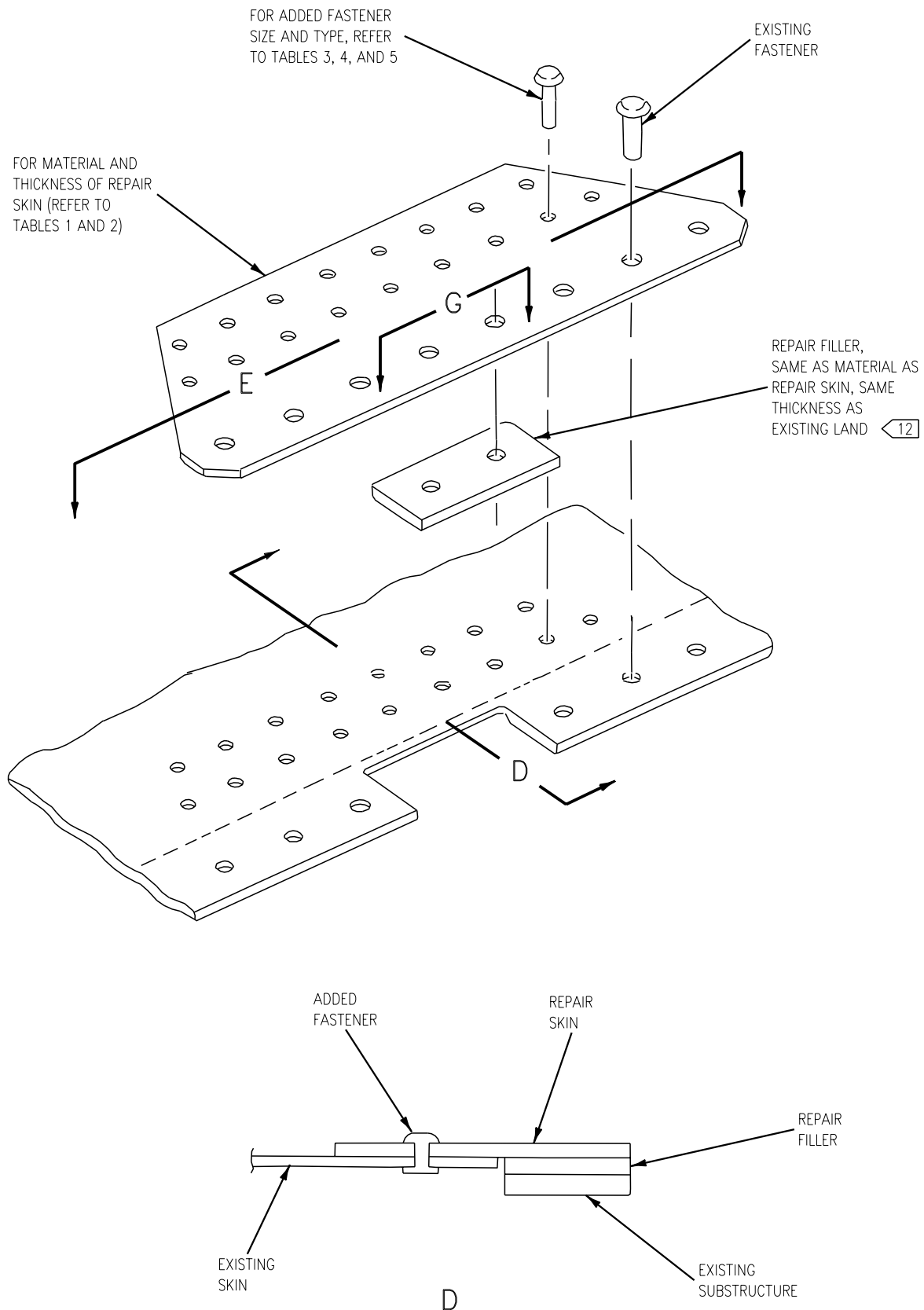
12 ○ -EXISTING FASTENER

13 ● -ADDED FASTENER

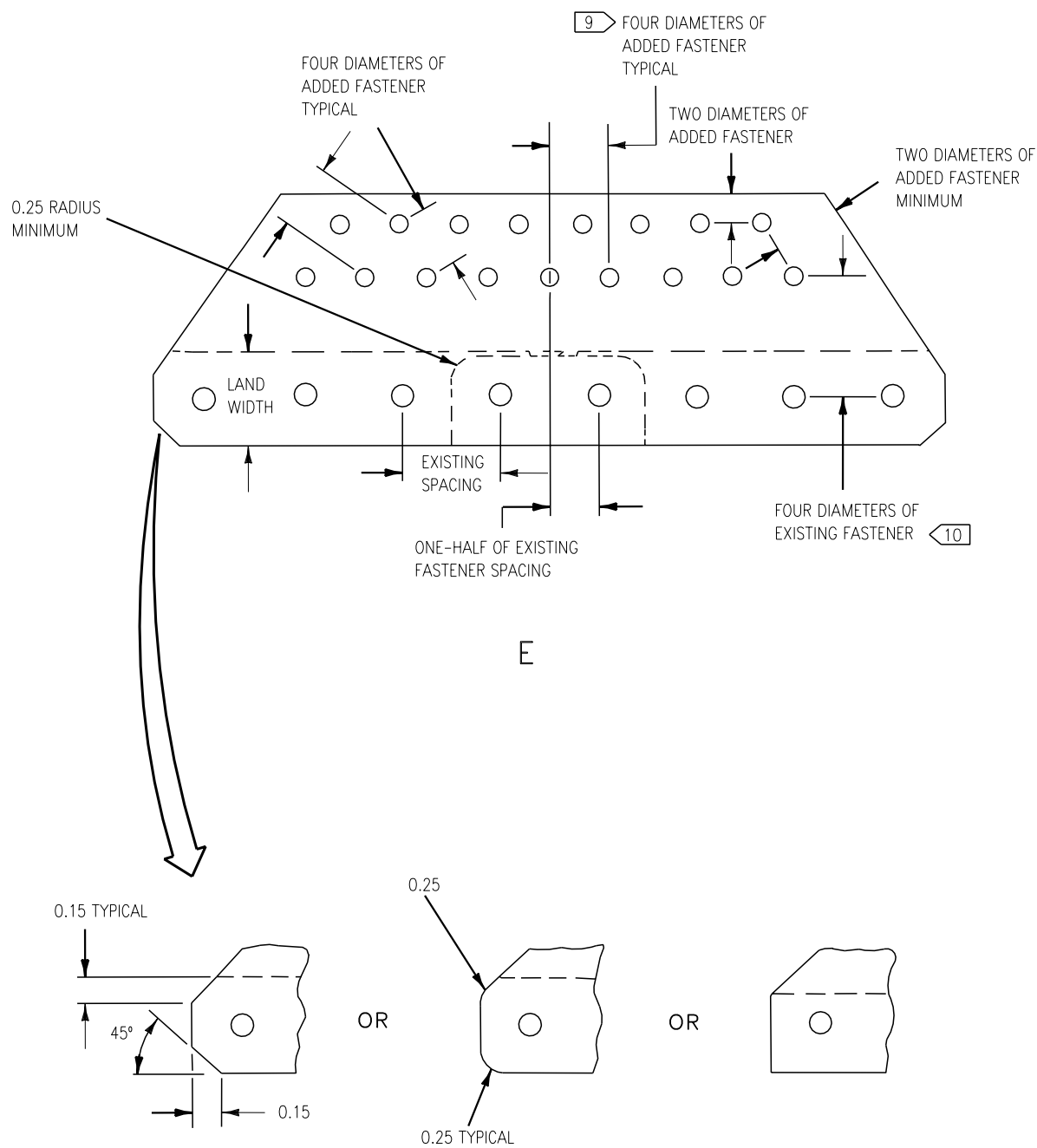
**Figure 2. Corner Damage to Lands and Bays (Sheet 2)**



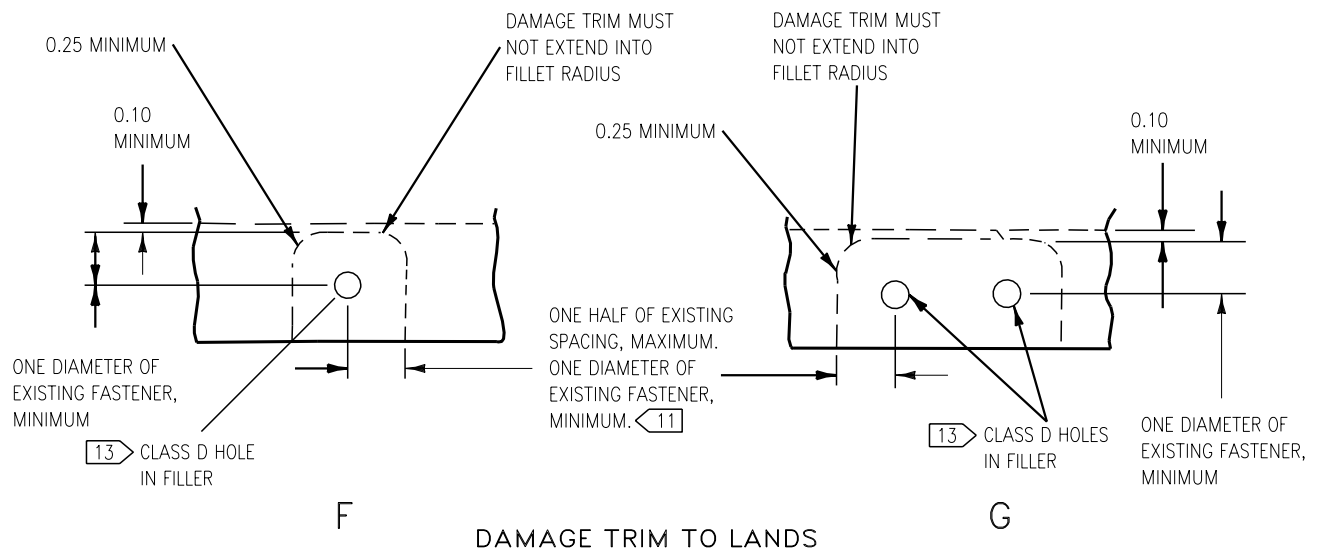
**Figure 3. Edge Damage to Lands (Sheet 1)**



**Figure 3. Edge Damage to Lands (Sheet 2)**



**Figure 3. Edge Damage to Lands (Sheet 3)**



## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
4. ADD COUNTERSINK FILLERS AS REQUIRED.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, AND 5.
7. EXISTING FASTENER MUST BE LARGER THAN ADDED FASTENER, SEE TABLES 3, 4, AND 5.
8. CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.

9 ADDED FASTENER ROW MUST EXTEND TO OR BEYOND FIRST EXISTING FASTENER FROM DAMAGE TRIM LINE.

10 IF FOUR DIAMETERS SPACING LOCATES FASTENER AT LESS THAN ONE AND ONE-HALF FROM MILL LINE, LOCATE FASTENER AT ONE AND ONE-HALF DIAMETERS.

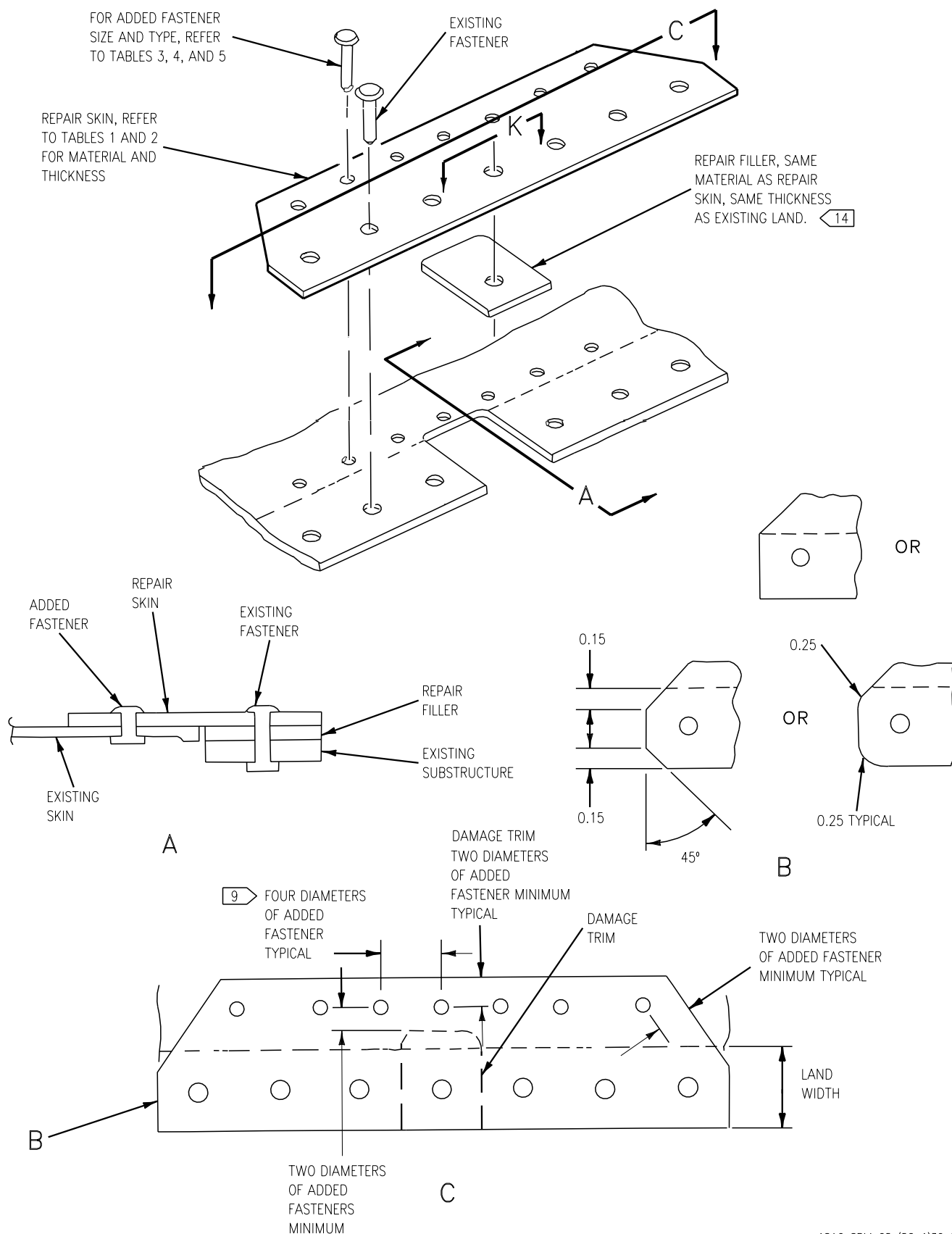
11 WITHIN THESE LIMITS, CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.

12 FOR REPAIRS TO DOORS OR OTHER REMOVABLE STRUCTURE, BOND THE REPAIR FILLER TO THE PATCH USING EA9321 A/B ADHESIVE (A1-F18AC-SRM-200 WP011 00). DRILL FASTENER HOLES IN FILLER BEFORE BONDING FILLER TO PATCH.

13 CLASS D HOLES ARE A LOOSE FIT HOLE, USED IN MOST CASES ON NON STRUCTURAL COMPONENTS.

Figure 3. Edge Damage to Lands (Sheet 4)





**Figure 4. Edge Damage to Lands and Bays (Sheet 1)**

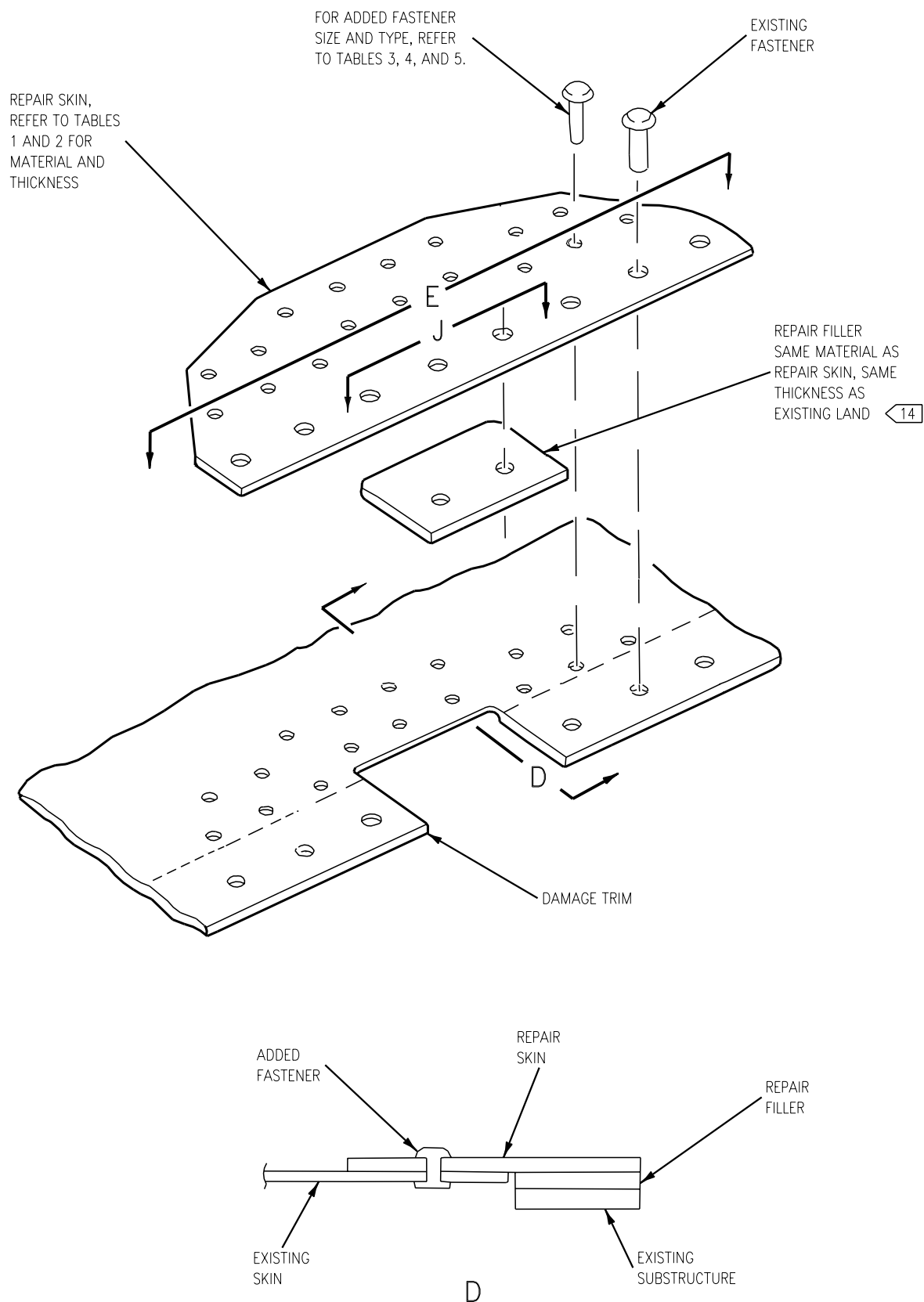
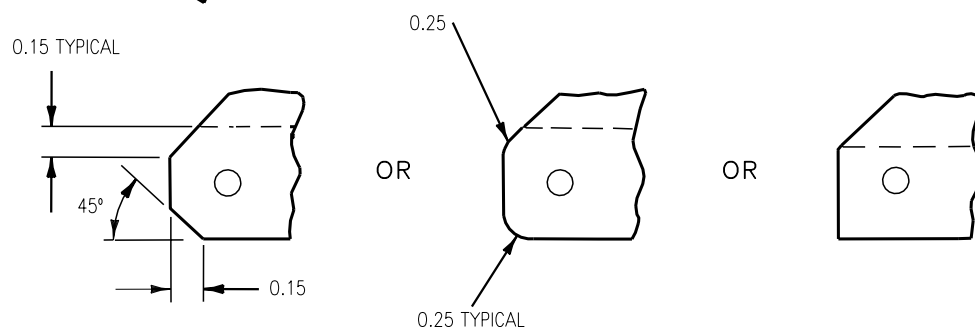
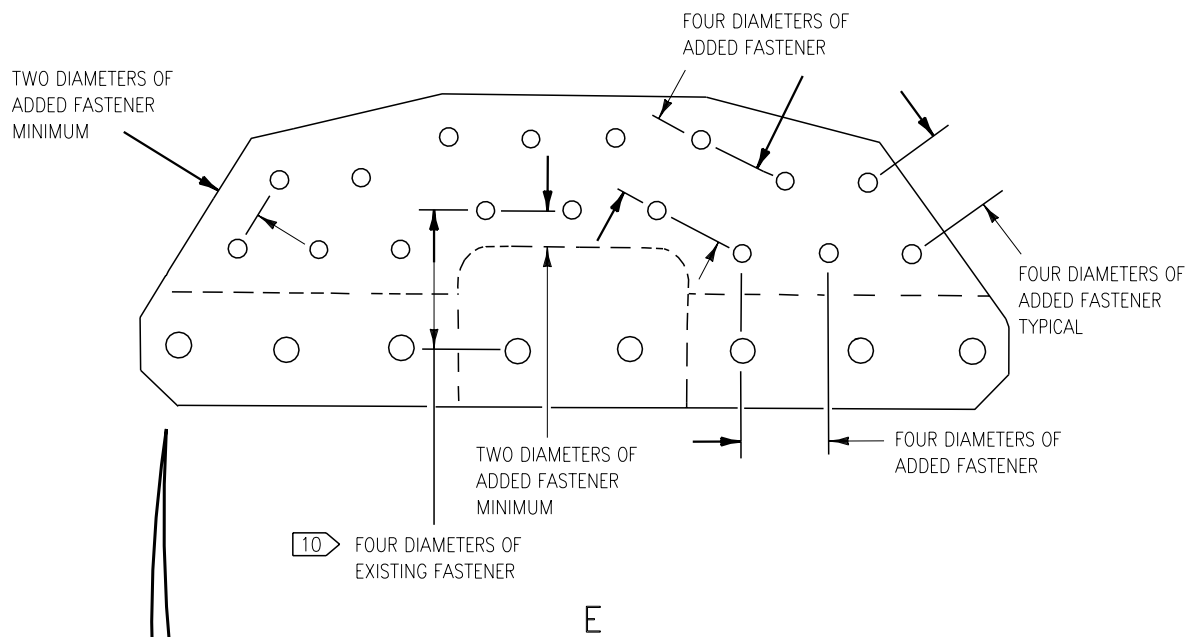
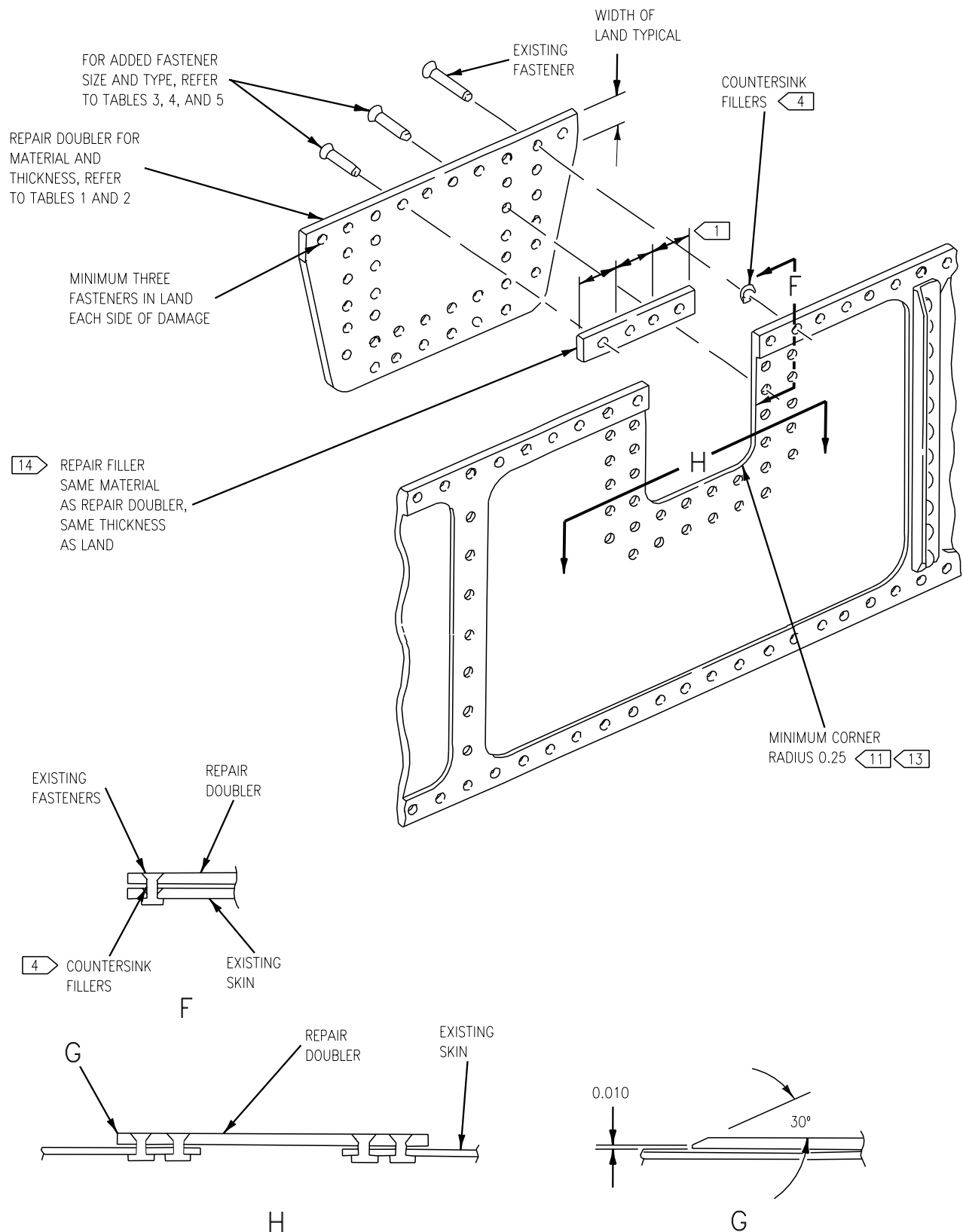


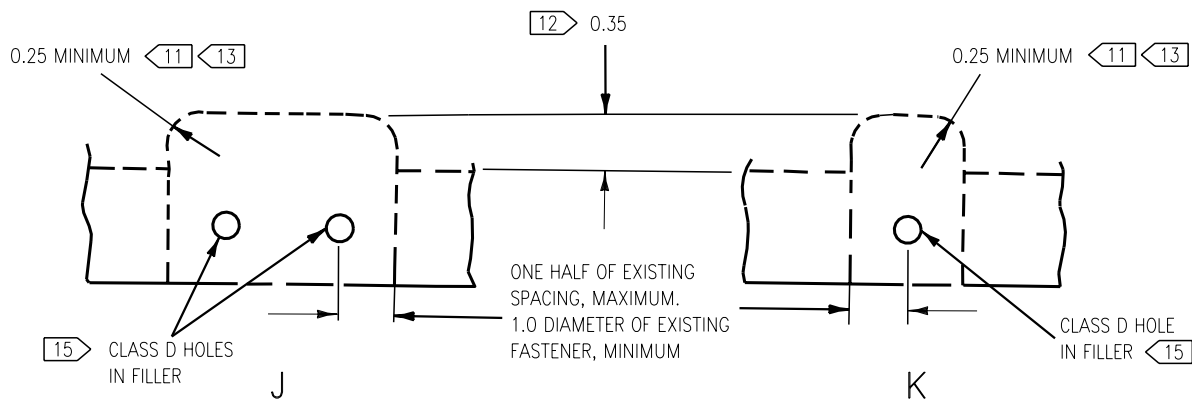
Figure 4. Edge Damage to Lands and Bays (Sheet 2)



**Figure 4. Edge Damage to Lands and Bays (Sheet 3)**



**Figure 4. Edge Damage to Lands and Bays (Sheet 4)**

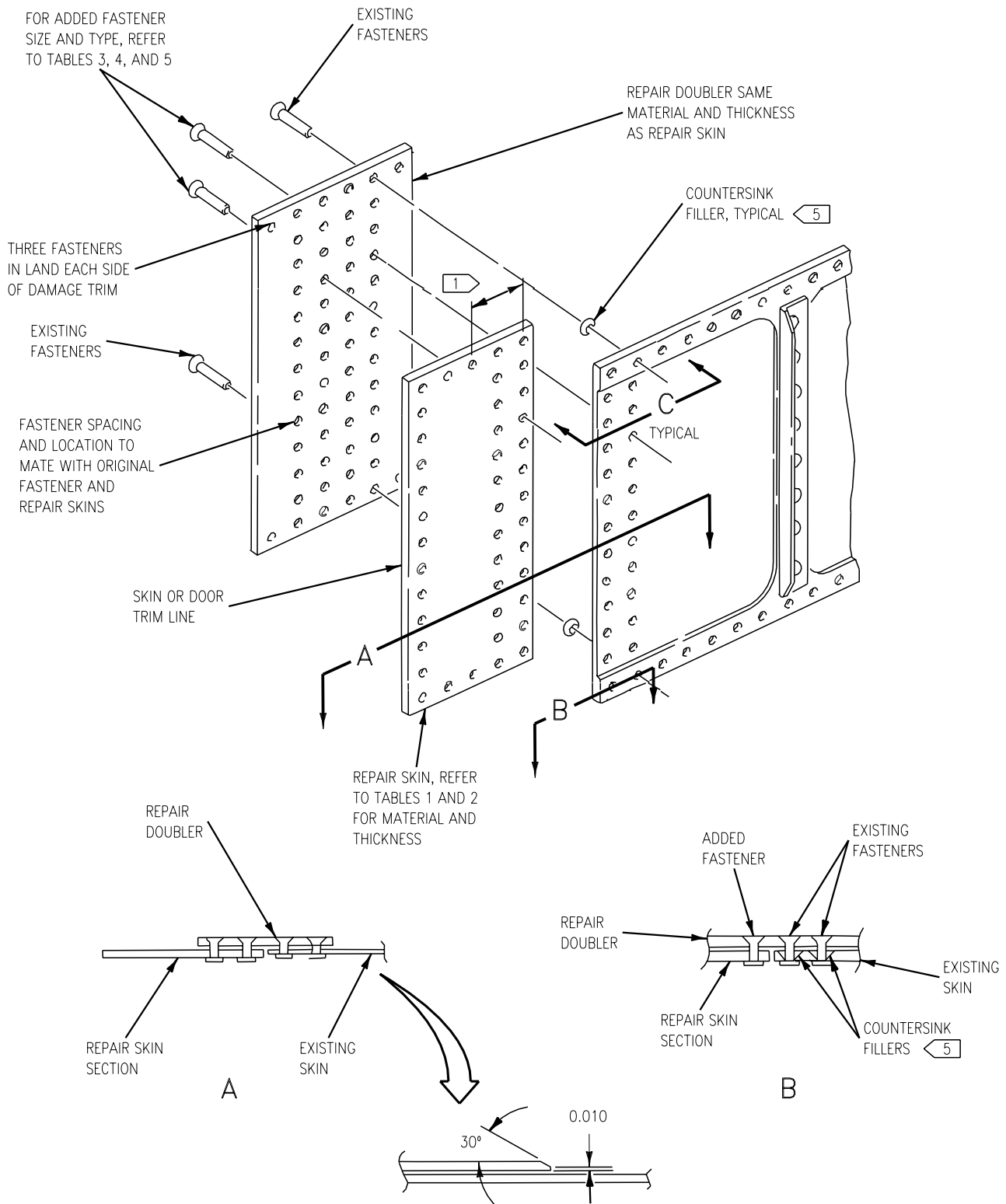


## DAMAGE TRIM TO LANDS AND BAY

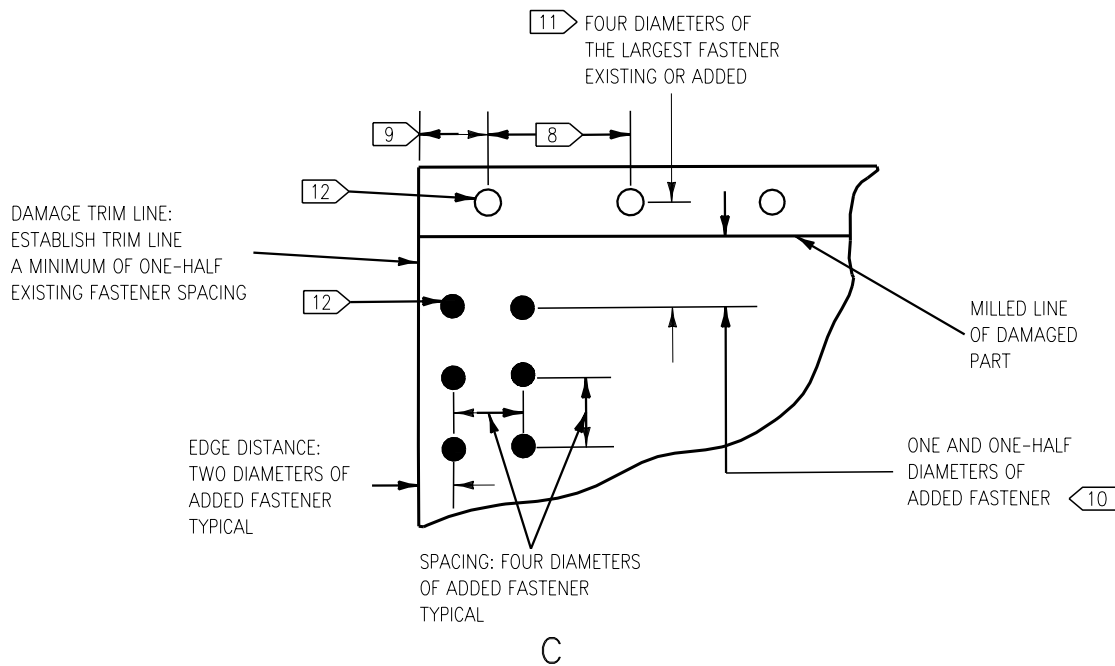
## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
- 4 ADDED COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDFLINE.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, AND 5.
7. EXISTING FASTENER MUST BE LARGER THAN ADDED FASTENER, SEE TABLES 3, 4, AND 5.
8. CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.
- 9 ADDED FASTENER ROW MUST EXTEND TO OR BEYOND SECOND EXISTING FASTENER FROM DAMAGE TRIM LINE.
- 10 IF FOUR DIAMETERS SPACING LOCATES FASTENER AT LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILL LINE, LOCATE FASTENER AT ONE AND ONE-HALF DIAMETERS.
- 11 WITHIN THESE LIMITS, CUT OUT ONLY ENOUGH MATERIAL TO REMOVE DAMAGE.
- 12 ALL DAMAGE EXTENDING INTO BAY SHALL BE TRIMMED BACK 0.35 INCH FROM MILLED FILLET. IF DAMAGE EXTENDS MORE THAN 0.35 INTO BAY, USE REPAIR ON SHEET 4.
- 13 TRIM RADIUS MUST NOT INTERSECT WITH MILLED FILLET.
- 14 FOR REPAIR TO DOORS OR OTHER REMOVABLE STRUCTURE, BOND THE REPAIR FILLER TO THE REPAIR PATCH USING EA9321 A/B ADHESIVE (A1-F18AC-SRM-200, WP011 00). DRILL FASTENER HOLES IN FILLER BEFORE BONDING FILLER.
- 15 CLASS D HOLES ARE A LOOSE FIT HOLE, USED IN MOST CASES ON NON STRUCTURAL COMPONENTS.

Figure 4. Edge Damage to Lands and Bays (Sheet 5)



**Figure 5. Full Width Damage to End (Sheet 1)**



## LEGEND

- 1 IF MISMATCH BETWEEN REPAIR FILLER, OR DOUBLER AND ORIGINAL LAND IS GREATER THAN 0.010 INCH, TAPER REPAIR PART FROM ORIGINAL LAND THICKNESS AT TRIM LINE TO REPAIR PART THICKNESS MIDWAY BETWEEN SECOND AND THIRD FASTENERS FROM TRIM LINE.
2. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
3. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
4. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
- 5 ADD COUNTERSINK FILLERS AS REQUIRED.
6. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
7. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, OR 5.
- 8 EXISTING FASTENER SPACING.
- 9 ONE-HALF EXISTING FASTENER SPACING.
- 10 ALL FASTENERS SHALL BE ALUMINUM AND ONE AND ONE-HALF DIAMETERS FROM ANY MILLED LINE.
- 11 IF FOUR DIAMETERS SPACING LOCATES FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM MILLED LINE, RELOCATE FASTENER TO COMPLY WITH NOTE TEN.
- 12 ○ - EXISTING FASTENER  
● - ADDED FASTENER

Figure 5. Full Width Damage to End (Sheet 2)

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**ORGANIZATIONAL MAINTENANCE****STRUCTURE REPAIR****TYPICAL REPAIR****ALUMINUM SHEET REPAIRS, ACROSS STRUCTURE AND LANDS**

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**Reference Material**

Structure Repair, General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application .....	WP011 00

**Alphabetical Index**

<b>Subject</b>	<b>Page No.</b>
Procedure .....	1

**Record of Applicable Technical Directives**

None

1. **PROCEDURE.** See figure 1.

2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to its stress intensity and repair zones. For stress intensity diagram and repair zones, refer to applicable structure repair manual in which part is shown. For method of repair, refer to figures 1 through 3 and tables 1 through 5, as required.

**Support Equipment Required**

None

**Materials Required**

None



Table 1. Repair Material Selection

Existing Material	Thickness	Repair Material
2024-T6	0.080 or less	7075-T6
6061 7050 7075	More than 0.080 ◀ 1	7075-T76
2024-T72	All	2024-T72
NOTE		
◀ 1 Existing material 6061, 7050, and 7075 may be any temper.		




Table 2. Repair Material Thickness Selection

Existing Thickness (Damaged) ▶ 1	Repair Thickness
0.020 or less	0.020
0.021 to 0.025	0.025
0.026 to 0.032	0.032
0.033 to 0.040	0.040
0.041 to 0.050	0.050
0.051 to 0.063	0.063
0.064 to 0.071	0.071
0.072 to 0.080	0.080
0.081 to 0.090	0.090
0.091 to 0.100	0.100
0.101 to 0.125	0.125
More than 0.125	▶ 2
NOTE	
▶ 1 Repair thickness selection is based on land thickness of damaged part.	
▶ 2 Repair requires engineering disposition.	

Table 3. Fastener Selection For Aluminum Repairs In Areas Other Than Inlets


Existing Thickness (Damaged) ▶ 1	Standard Fastener		Blind Fastener	
	Flush ▶ 2	Protruding	Flush ▶ 2	Protruding
0.020 or Less	BRFS4AD( )	MS20470AD4	PLT1058-5-( )	NAS1398C-4( )
0.021 to 0.025	BRFS4AD( )	MS20470AD4	PLT1058-5-( )	NAS1398C-4( )
0.026 to 0.032	BRFS4T( )	CSR9038-4-( )	PLT1058-5-( )	NAS1398C-4( )
0.033 to 0.040	BRFS4T( )	CSR9038-4-( )	PLT1058-5-( )	NAS1398C-4( )
0.041 to 0.050	BRFS4T( )	CSR9038-4-( )	PLT1058-5-( )	NAS1398C-4( )
0.051 to 0.063	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.064 to 0.071	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )

**Table 3. Fastener Selection For Aluminum Repairs In Areas Other Than Inlets (Continued)**

Existing Thickness (Damaged)  1	Standard Fastener		Blind Fastener	
	Flush  2	Protruding	Flush  2	Protruding
0.072 to 0.080	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.081 to 0.090	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.091 to 0.100	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.101 to 0.125	HLT51DL-5-( )	HLT50DL-5-( )	MS90353-05-( )	MS90354-05( )




**NOTE**

 1 Fastener selection is based on bay thickness of damaged parts.

 2 When using below listed fasteners it is possible to countersink too deep. Minimum material thickness required for these fasteners is:


Fastener	Minimum Material Thickness
BRFS4AD( )	0.033
BRFS4T( )	0.033
HLT311DL-5-( )	0.057
PLT1058-5-( )	0.057


**Table 4. Fastener Selection For Aluminum Repairs In Inlet Areas**

Existing Thickness (Damaged)  1	 2 Standard Fastener	
	Flush  3	Protruding
0.020 or Less	BRFS4AD( )	MS20470AD4
0.021 to 0.025	BRFS4AD( )	MS20470AD4
0.026 to 0.032	BRFS4T( )	CSR9038-4-( )
0.033 to 0.040	BRFS4T( )	CSR9038-4-( )
0.041 to 0.050	BRFS4T( )	CSR9038-4-( )
0.051 to 0.063	NAS2705V( )	NAS2605V( )
0.064 to 0.071	NAS2705V( )	NAS2605V( )
0.072 to 0.080	NAS2705V( )	NAS2605V( )
0.081 to 0.090	NAS2705V( )	NAS2605V( )
0.091 to 0.100	NAS2705V( )	NAS2605V( )
0.101 to 0.125	2705MU-( )	2605MU-( )

**NOTE**

 1 Fastener selection is based on bay thickness of damaged parts.

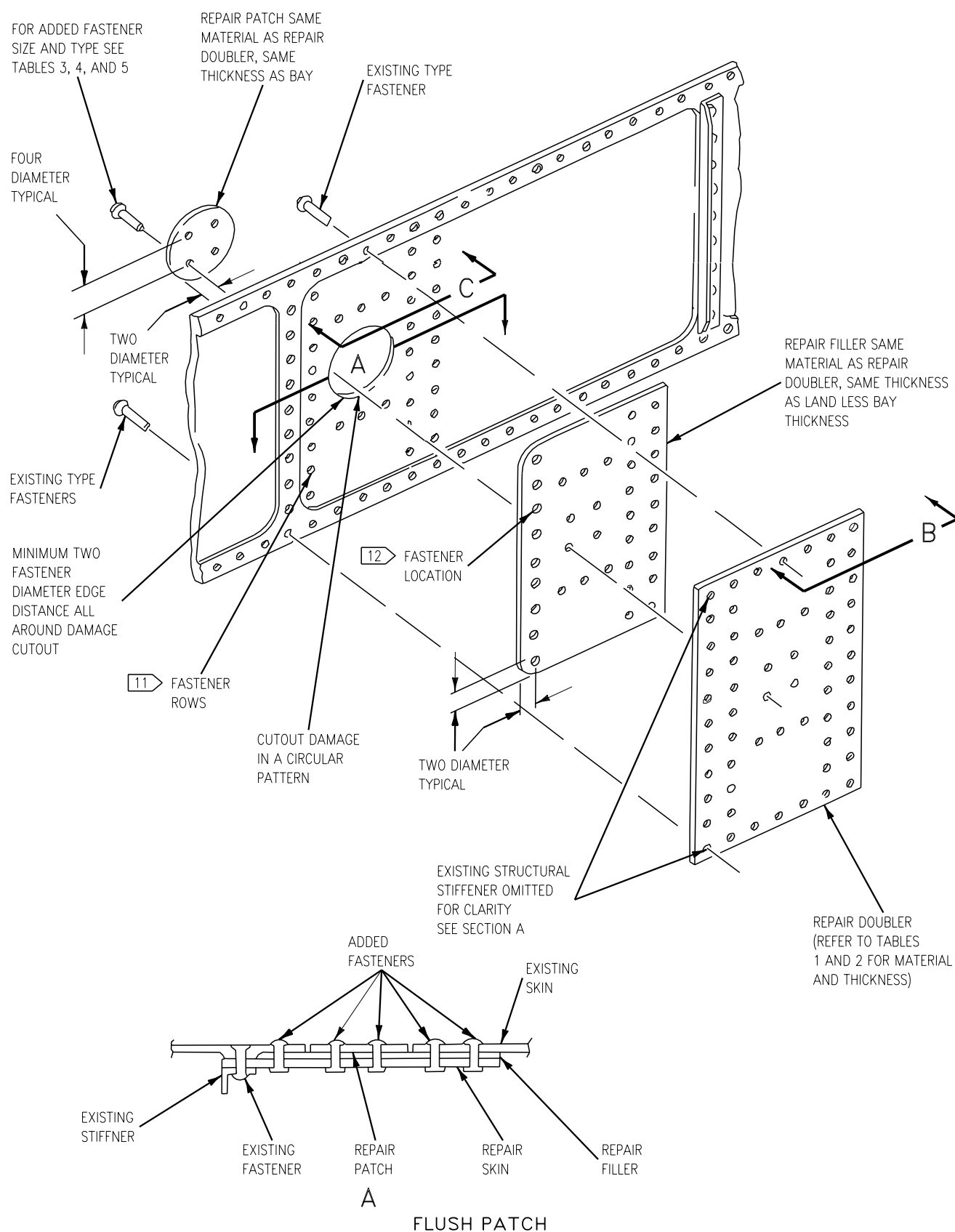
 2 Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate.

 3 When using below listed fasteners it is possible to countersink too deep. Minimum material thickness for these fasteners is:

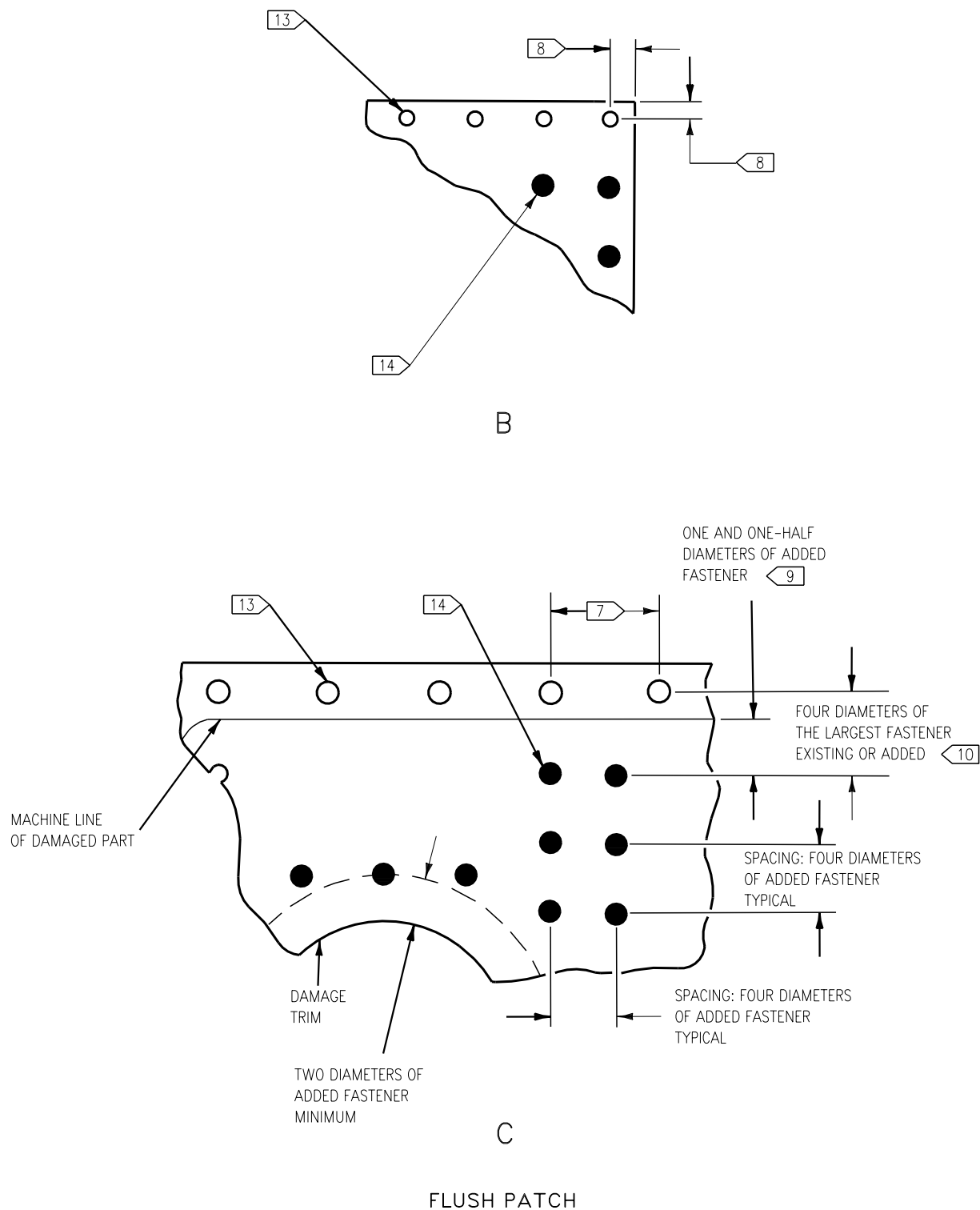
Fastener	Minimum Material Thickness
BRFS4AD( )	0.033
BRFS4T( )	0.033
NAS2705V( )	0.057

Table 5. Fastener Selection For Aluminum Repairs in Inlet Areas.

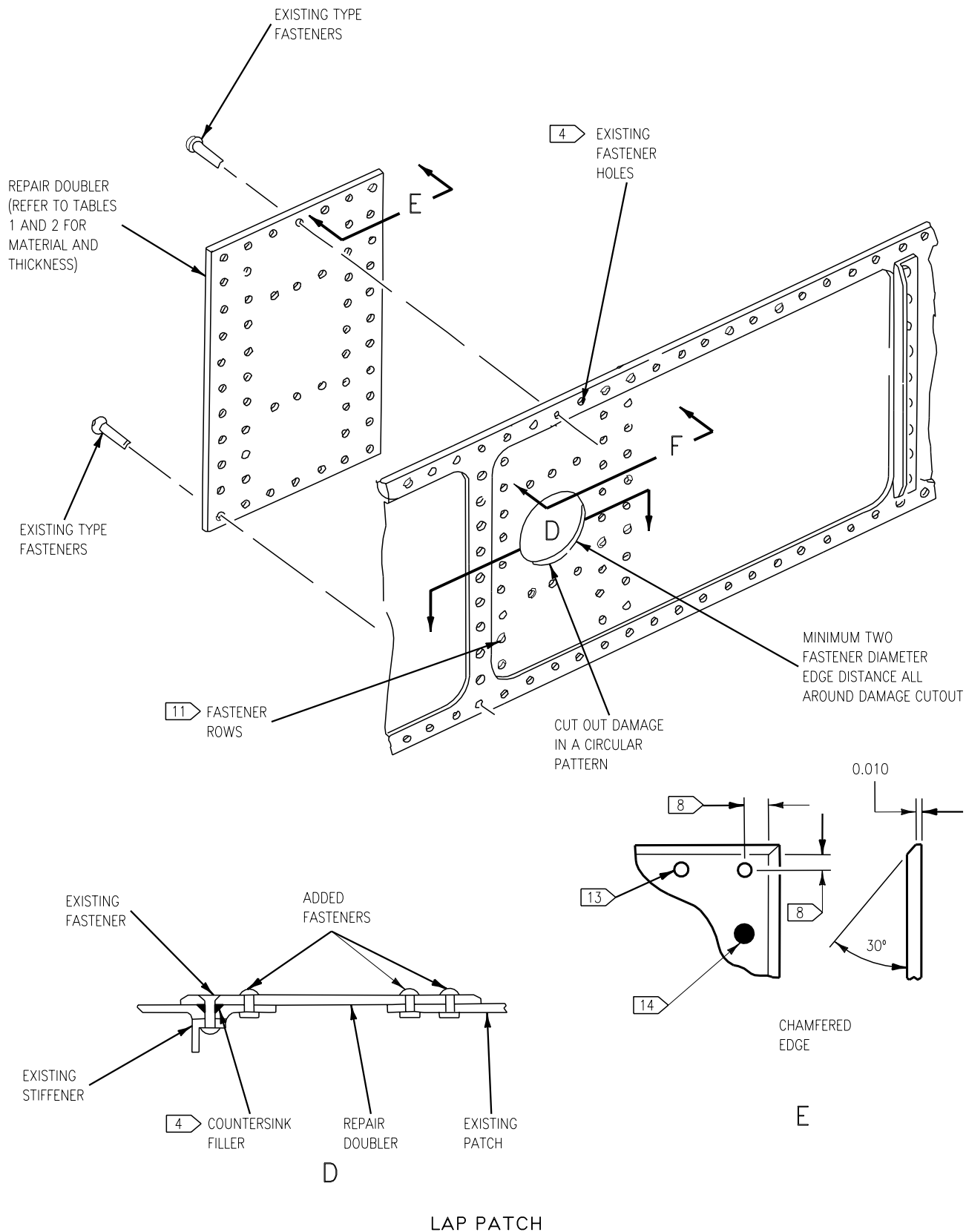
BLIND FASTENERS <span>1</span> <span>2</span>			
FLUSH			
MCDONNELL NO.	MATERIAL THICKNESS <span>3</span>	EDGE DISTANCE	SPACING
NAS1399C4A( )	0.063	0.28	0.50 To 0.55
NAS1399C4A( )	0.071	0.28	0.50 To 0.55
NAS1399C5A( )	0.080	0.35	0.62 To 0.68
NAS1399C5A( )	0.090	0.35	0.62 To 0.68
NAS1399C6A( )	0.100	0.41	0.75 To 0.83
NAS1399C6A( )	0.125	0.41	0.75 To 0.83
PROTRUDING			
NAS1398C4A( )	0.012	0.28	0.50 To 0.55
NAS1398C4A( )	0.020	0.28	0.50 To 0.55
NAS1398C4A( )	0.025	0.28	0.50 To 0.55
NAS1398C4A( )	0.032	0.28	0.50 To 0.55
NAS1398C4A( )	0.040	0.28	0.50 To 0.55
NAS1398C4A( )	0.050	0.28	0.50 To 0.55
NAS1398C5A( )	0.063	0.35	0.62 To 0.68
NAS1398C5A( )	0.071	0.35	0.62 To 0.68
NAS1398C5A( )	0.080	0.35	0.62 To 0.68
NAS1398C5A( )	0.090	0.35	0.62 To 0.68
NAS1398C5A( )	0.100	0.35	0.62 To 0.68
NAS1398C5A( )	0.125	0.35	0.62 To 0.68
<b>NOTE</b> <span>1</span> Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate. <span>2</span> Grip gage each hole to determine correct fastener length. Install blind fasteners wet with MIL-S-83430 (A1-F18AC-SRM-200, WP011 00). <span>3</span> Based on bay thickness.			



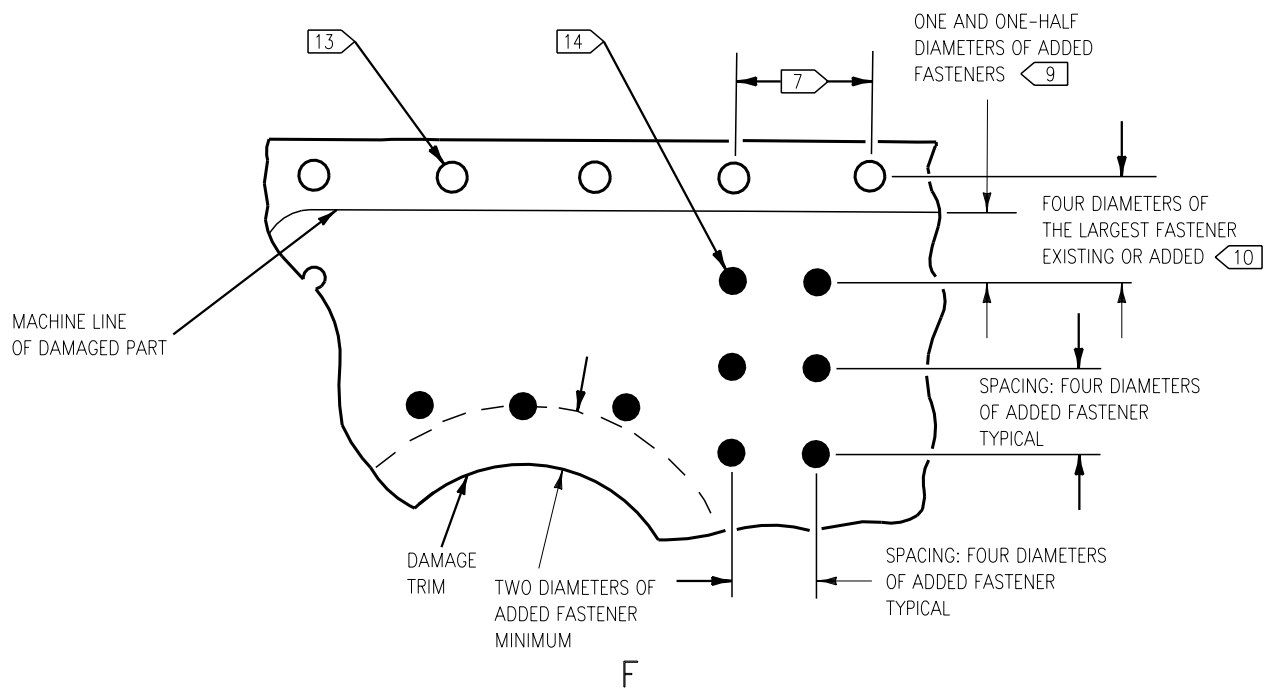
**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 1)**



**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 2)**



**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 3)**



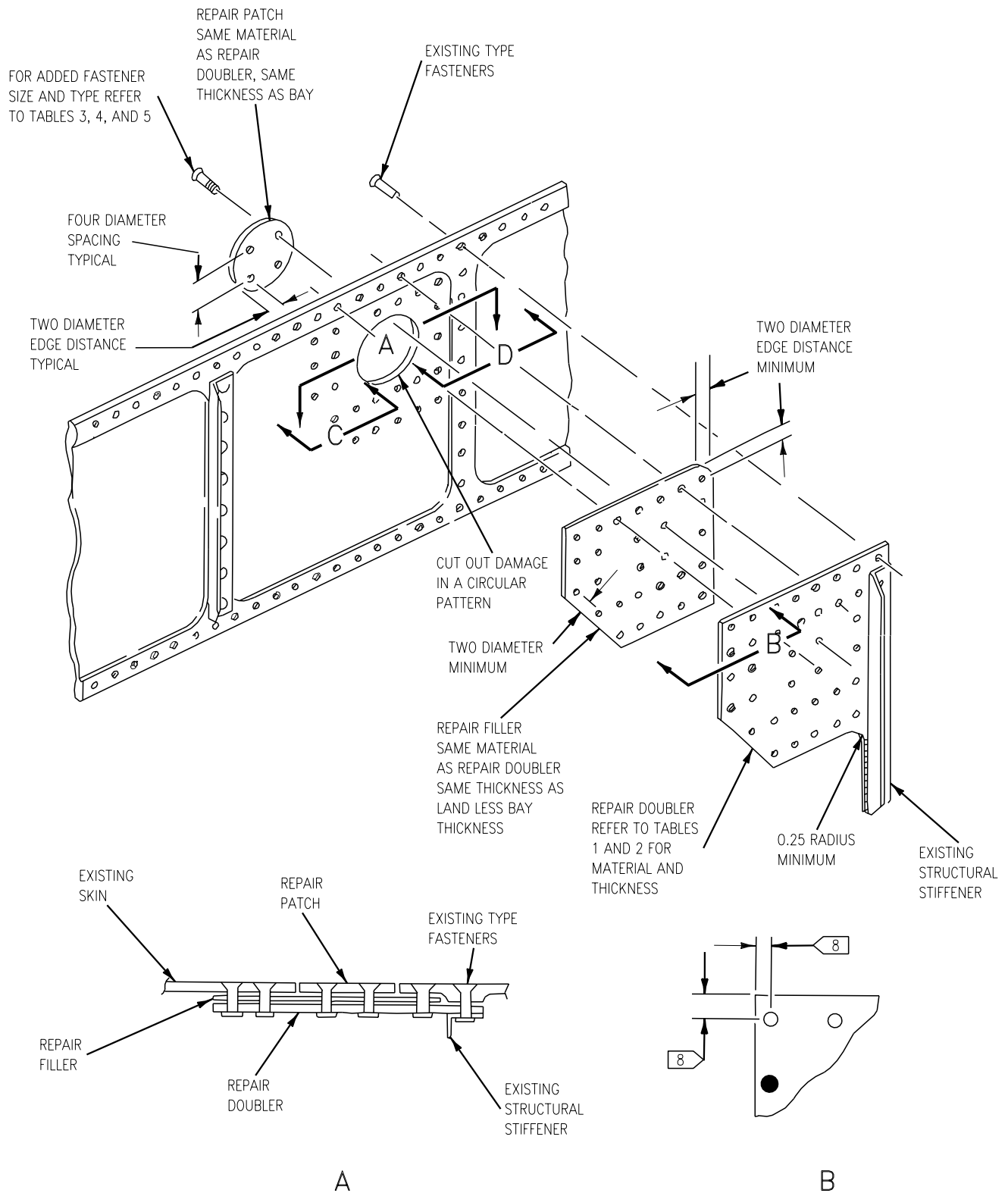
## LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MILLED STEPS.
4. ADD COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDLINE.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, AND 5.
7. EXISTING FASTENER SPACING.
8. ONE-HALF EXISTING FASTENER SPACING.
9. ALL FASTENERS SHALL BE A MINIMUM OF ONE AND ONE-HALF DIAMETERS FROM ANY MACHINED LINE.
10. IF FOUR DIAMETERS SPACING PLACES THE FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM THE MACHINED LINE, RELOCATE THE FASTENER TO COMPLY WITH NOTE NINE.
11. TWO ROWS OF FASTENERS REQUIRED, THIS ROW MAY BE ON THE OTHER SIDE OF THE LAND WITH THE REQUIRED ADDITIONAL FILLER.
12. LOCATION AND SPACING TO MATE WITH ORIGINAL SKIN AND REPAIR SKIN.
13. ○ - EXISTING FASTENER.
14. ● - ADDED FASTENER.

## LAP PATCH

18AC-SRM-25-(52-4)36-CATI

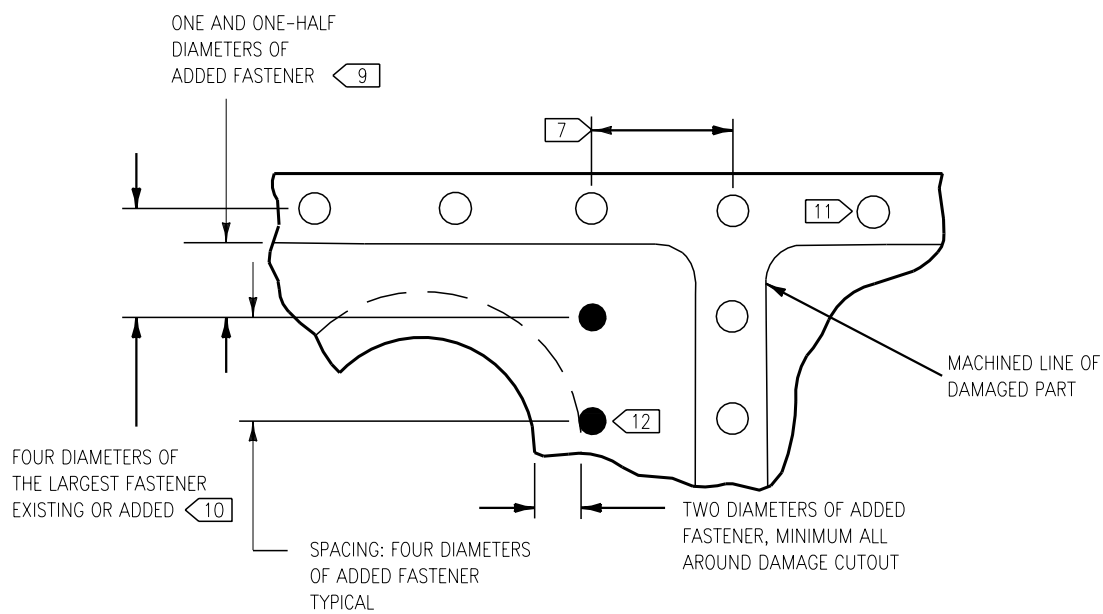
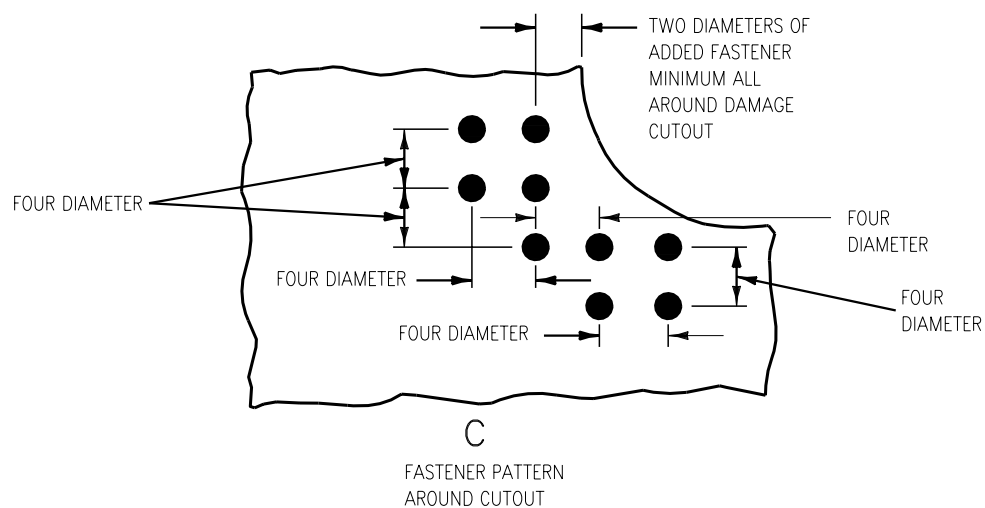
Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 4)



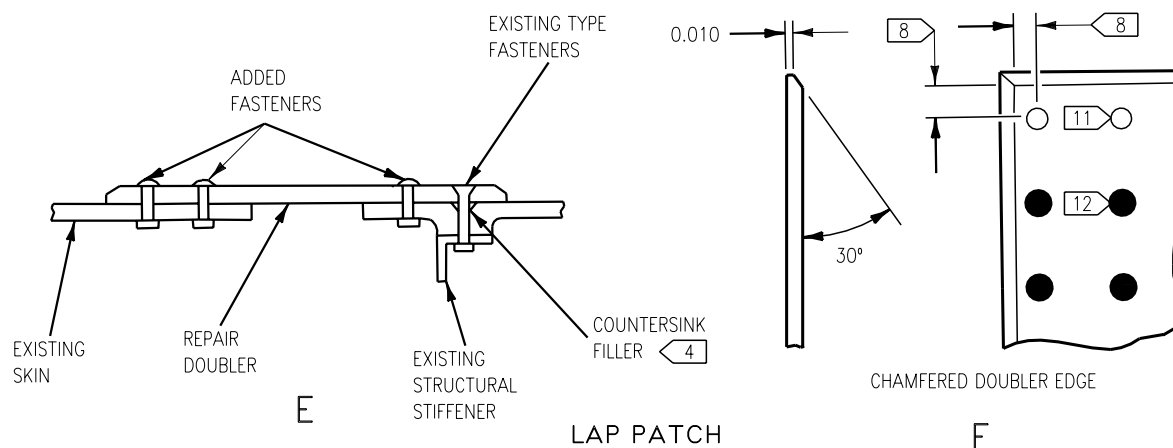
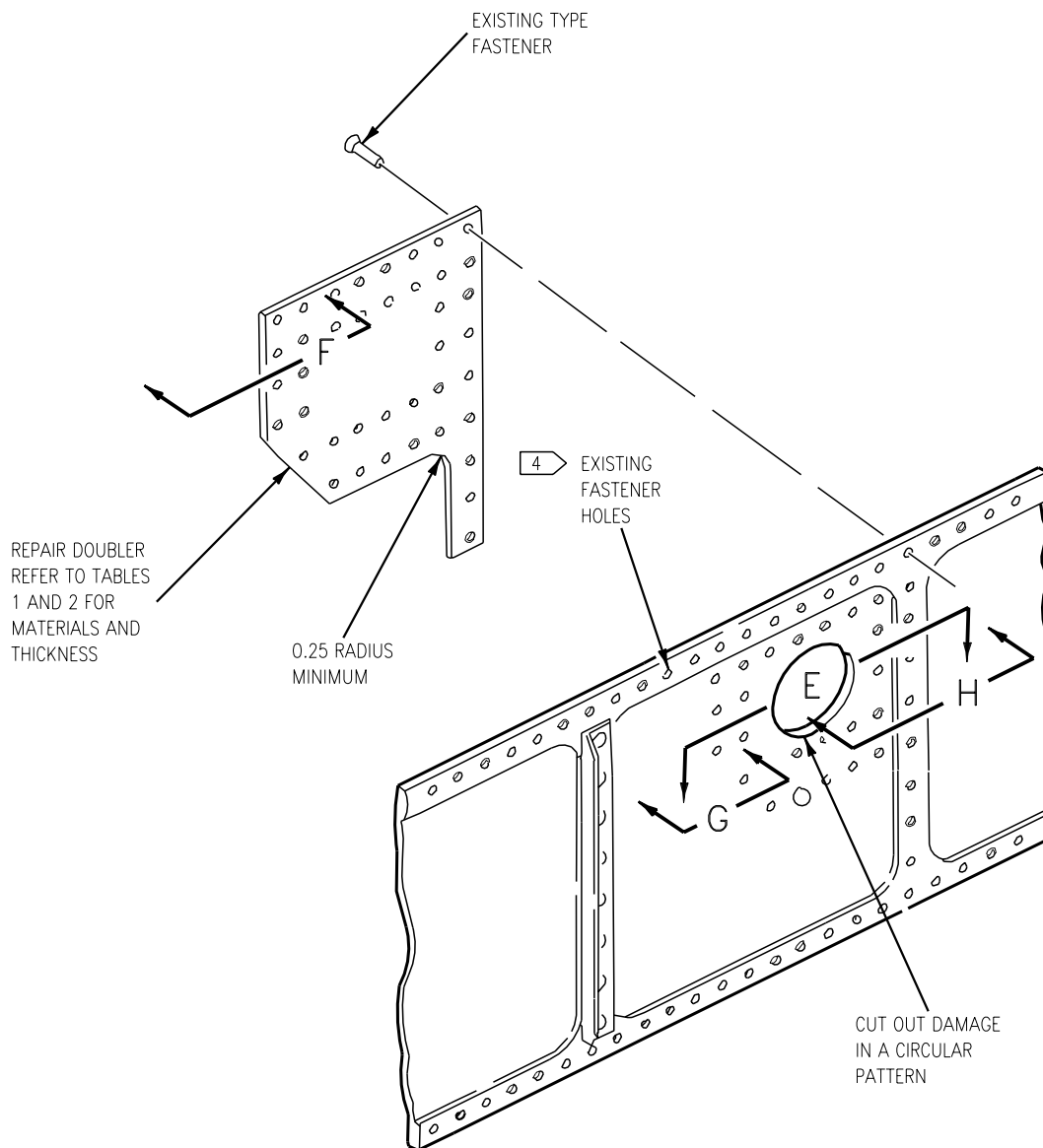
FLUSH PATCH

Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 1)

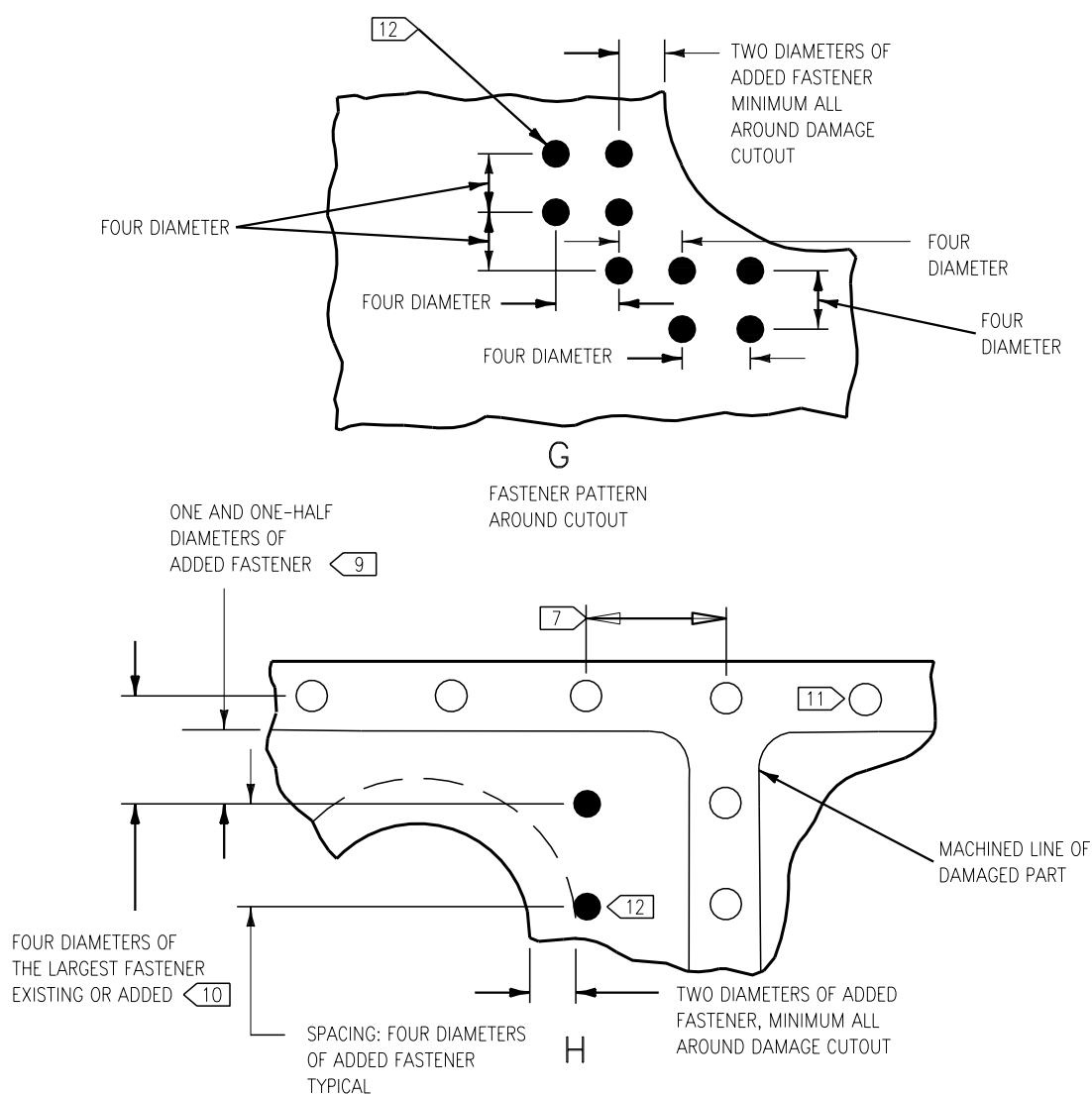






**Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 2)**



**Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 3)**

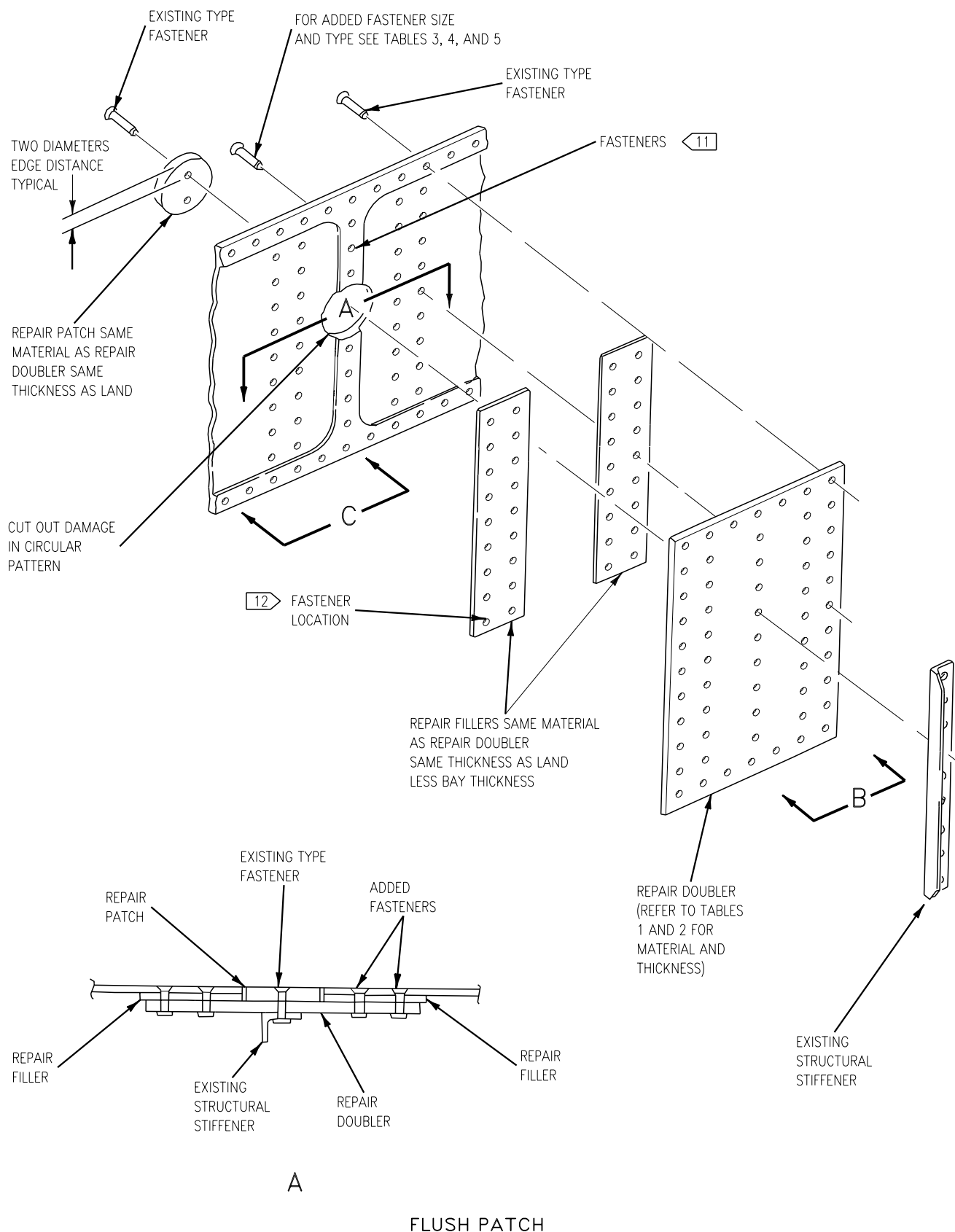


## LEGEND

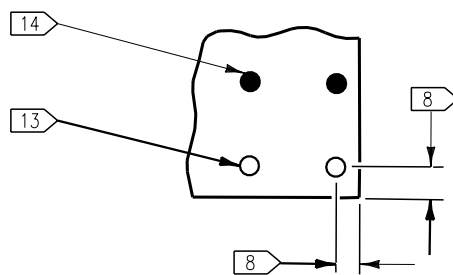
1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
  2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
  3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MACHINED STEPS.
  4. ADD COUNTERSUNK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDFLINE.
  5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
  6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLE 3, 4, OR 5.
  7. EXISTING FASTENER SPACING.
  8. ONE-HALF EXISTING FASTENER SPACING.
  9. ALL FASTENERS SHALL BE A MINIMUM OF ONE AND ONE-HALF DIAMETERS FROM ANY MACHINED LINE.
  10. IF FOUR DIAMETERS SPACING PLACES THE FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM THE MACHINED LINE, RELOCATE THE FASTENER TO COMPLY WITH NOTE NINE.
  11.  - EXISTING FASTENER.
  12.  - ADDED FASTENER.

## LAP PATCH

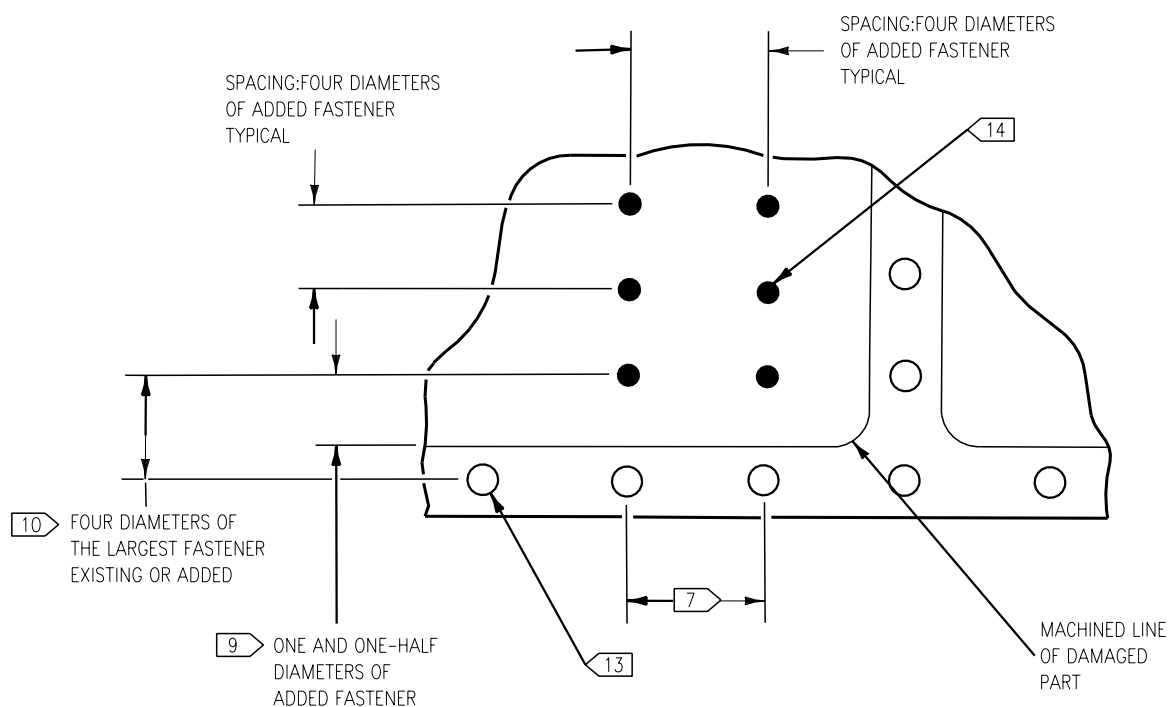
**Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 4)**



**Figure 3. Damage to Land, or Land and Bay (Sheet 1)**



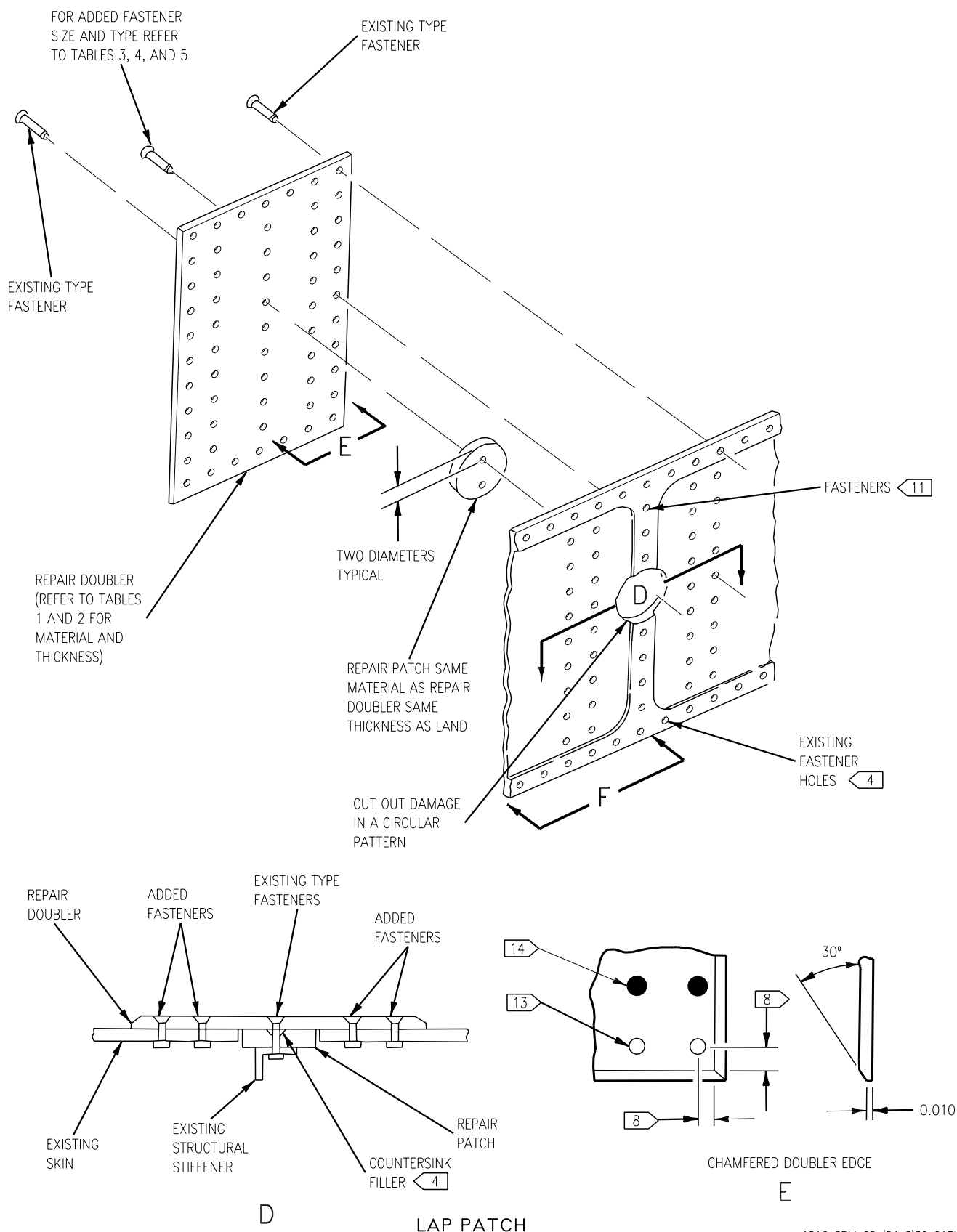
B



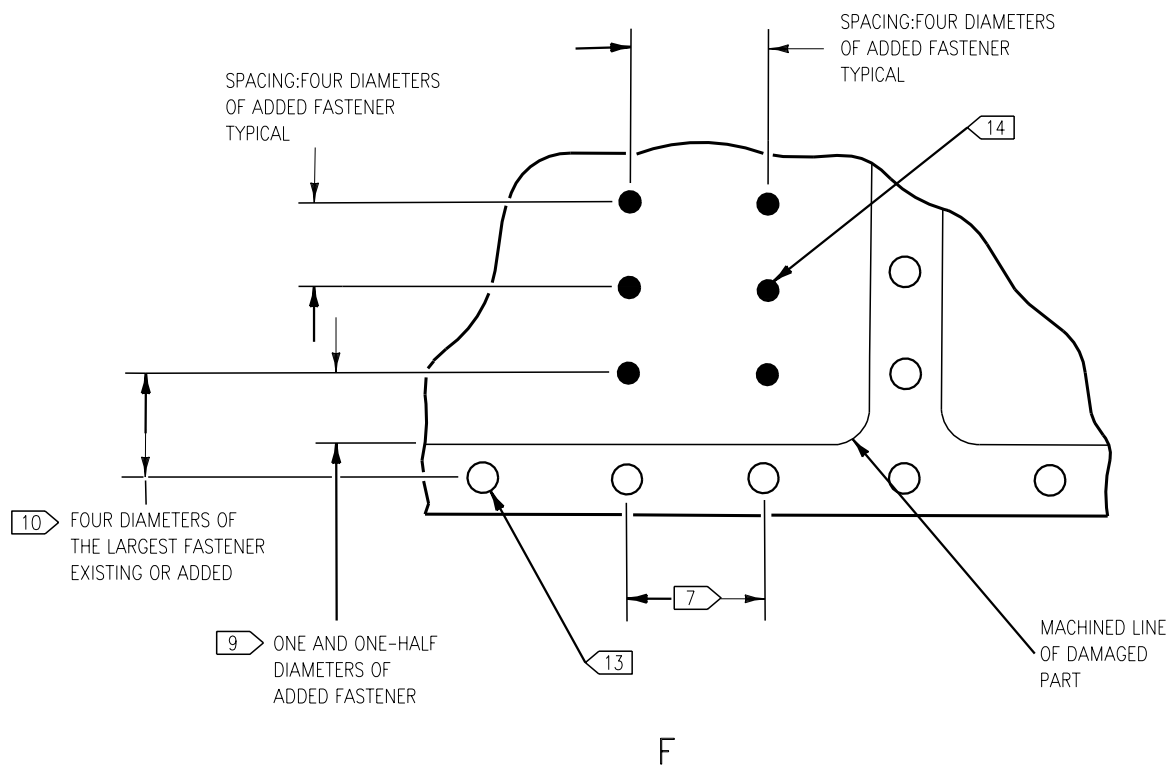
C

FLUSH PATCH

Figure 3. Damage to Land, or Land and Bay (Sheet 2)



**Figure 3. Damage to Land, or Land and Bay (Sheet 3)**



## LEGEND

- |   |  |
|---|--|
| <p>1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.</p> <p>2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.</p> <p>3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MACHINED STEPS.</p> <p>4 ADD COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDFINE.</p> <p>5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.</p> <p>6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLE 3, 4, OR 5.</p> <p>7 EXISTING FASTENER SPACING.</p> <p>8 ONE-HALF EXISTING FASTENER SPACING.</p> | <p>9 ALL FASTENERS SHALL BE A MINIMUM OF ONE AND ONE-HALF DIAMETERS FROM ANY MACHINED LINE.</p> <p>10 IF FOUR DIAMETERS SPACING PLACES THE FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM THE MACHINED LINE, RELOCATE THE FASTENER TO COMPLY WITH NOTE NINE.</p> <p>11 THREE FASTENERS MINIMUM ON EACH SIDE OF CUTOUT.</p> <p>12 LOCATION AND SPACING TO MATE WITH ORIGINAL SKIN AND REPAIR SKIN.</p> <p>13 ○-EXISTING FASTENERS.</p> <p>14 ●-ADDED FASTENERS.</p> |
|---|--|

LAP PATCH

Figure 3. Damage to Land, or Land and Bay (Sheet 4)

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## TITANIUM SHEET REPAIRS, ACROSS STRUCTURE AND LANDS

## Reference Material

Structure Repair, General Information .....	A1-F18AC-SRM-200
Adhesive, Cement, and Sealant; Preparation and Application .....	WP011 00

## Alphabetical Index

Subject	Page No.
Procedure .....	1

## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1. through 5, as required.

2. Repairs in this work package have been referred to from other structure repair series manuals containing affected component or part. Before any type of repair can be determined, the area requiring repair will be classified as to its stress intensity and repair zones. For stress intensity diagram and repair zones, refer to the applicable structure repair manual in which the part is shown. For method of repair, refer to figures 1 through 3 and tables 1

## Support Equipment Required

None

## Materials Required

None

Table 1. Repair Material Selection

Existing Material	Thickness	Repair Material
6AL-4V Ti	All	6AL-4V Ti

Table 2. Repair Material Thickness Selection


Existing Thickness (Damaged) 	Repair Thickness
0.020 or less	0.020



Table 2. Repair Material Thickness Selection (Continued)

Existing Thickness (Damaged) <input type="text" value="1"/>	Repair Thickness
0.021 to 0.025	0.025
0.026 to 0.032	0.032
0.033 to 0.040	0.040
0.041 to 0.050	0.050
0.051 to 0.063	0.063
0.064 to 0.071	0.071
0.072 to 0.080	0.080
0.081 to 0.090	0.090
0.091 to 0.100	0.100
0.101 to 0.125	0.125
More than 0.125	<input type="text" value="2"/>

**NOTE**

Repair thickness and selection is based on land thickness of damaged part.

Repair requires engineering disposition.

Table 3. Fastener Selection For Titanium Repairs In Areas Other Than Inlets

Existing Thickness (Damaged) <input type="text" value="1"/>	Standard Fastener		Blind Fastener	
	Flush <input type="text" value="2"/>	Protruding	Flush <input type="text" value="2"/>	Protruding
0.020 or Less	BRFS5T( )	CSR9038-5-( )	PLT1058-5-( )	PLT270-5-( )
0.21 to 0.025	BRFS5T( )	CSR9038-5-( )	PLT1058-5-( )	PLT270-5-( )
0.026 to 0.032	BRFS6T( )	CSR9038-6-( )	PLT1058-5-( )	PLT270-6-( )
0.033 to 0.040	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.041 to 0.050	HLT311DL-5-( )	HLT310DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.051 to 0.063	HLT51DL-5-( )	HLT50DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.064 to 0.071	HLT51DL-5-( )	HLT50DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.072 to 0.080	HLT51DL-5-( )	HLT50DL-5-( )	PLT1058-5-( )	MS90354-05( )
0.081 to 0.090	HLT51DL-6-( )	HLT50DL-6-( )	PLT1058-6-( )	MS90354-06( )
0.091 to 0.100	HLT51DL-8-( )	HLT50DL-8-( )	PLT1058-8-( )	MS90354-08( )
0.101 to 0.125	HLT51DL-8-( )	HLT50DL-8-( )	PLT1058-8-( )	MS90354-08( )

**NOTE**

Fastener selection is based on bay thickness of damaged parts.

When using below listed fasteners it is possible to countersink too deep. Minimum material thickness required for these fasteners is:

Fastener	Minimum Material Thickness
BRFS5T-( )	0.043
BRFS6T-( )	0.056
HLT311DL-5-( )	0.057
HLT51DL-5-( )	0.057
PLT1058-5-( )	0.057

Table 4. Fastener Selection For Titanium Repairs In Inlet Areas

Existing Thickness (Damaged) ◀ 1	2 ▶ Standard Fastener	
	Flush 3 ▶	Protruding
0.020 or Less	BRFS5T( )	CSR9038-5-( )
0.021 to 0.025	BRFS5T( )	CSR9038-5-( )
0.026 to 0.032	BRFS6T( )	CSR9038-6-( )
0.033 to 0.040	NAS2705V( )	NAS2605V( )
0.041 to 0.050	NAS2705V( )	NAS2605V( )
0.051 to 0.063	2705MU( )	2605MU( )
0.064 to 0.071	2705MU( )	2605MU( )
0.072 to 0.080	2705MU( )	2605MU( )
0.081 to 0.090	2706MU( )	2606MU( )
0.091 to 0.100	2708MU( )	2608MU( )
0.101 to 0.125	2708MU( )	2608MU( )

## NOTE

- 1 ▶ Fastener selection is based on bay thickness of damaged parts.
- 2 ▶ Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate.
- 3 ▶ When using below listed fasteners it is possible to countersink too deep. Minimum material thickness for these fasteners is:

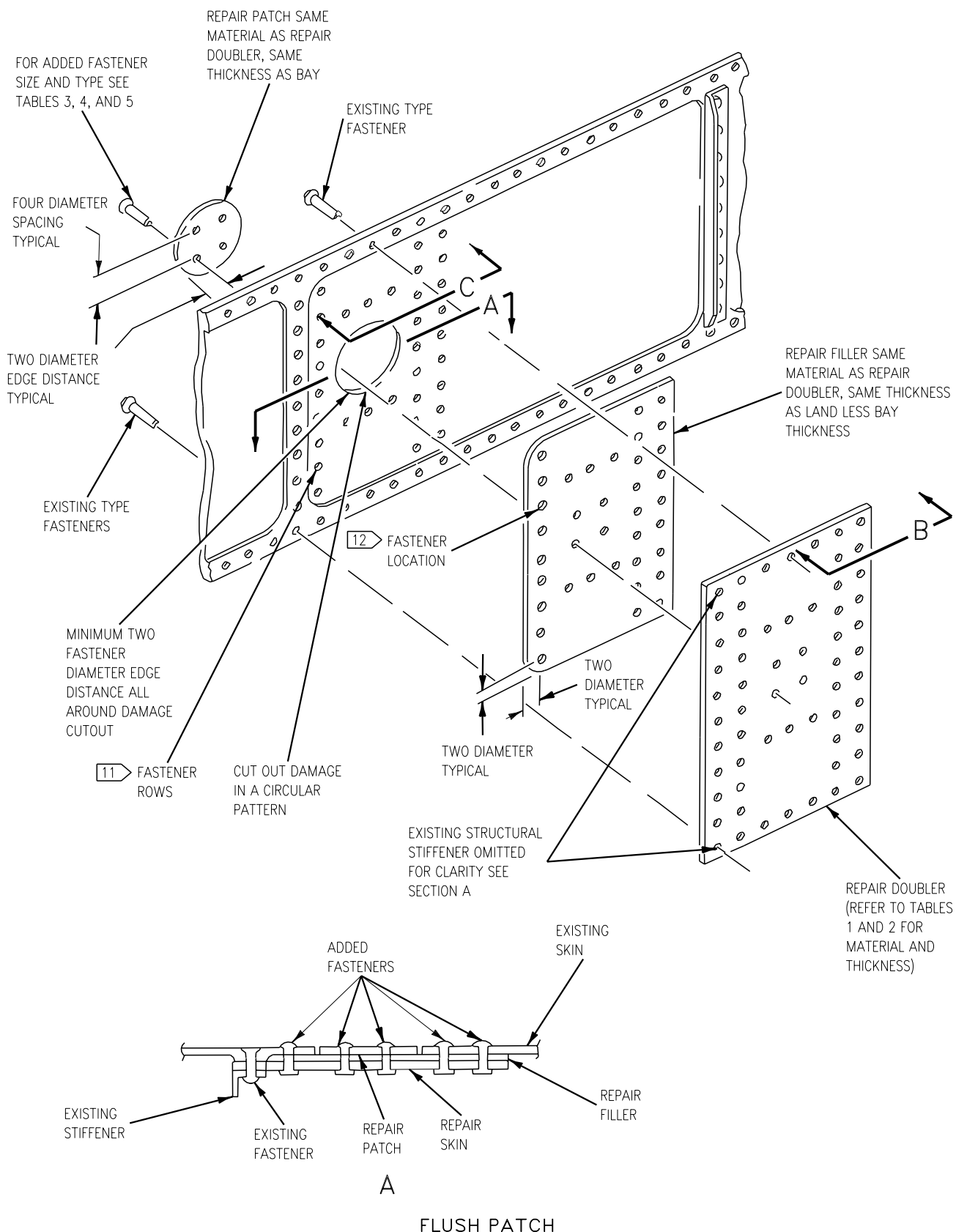
Fastener	Minimum Material Thickness
BRFS5T( )	0.043
BRFS6T-( )	0.056
NAS2705V( )	0.057
2705MU-( )	0.057

Table 5. Fastener Selection For Titanium Repairs in Inlet Areas

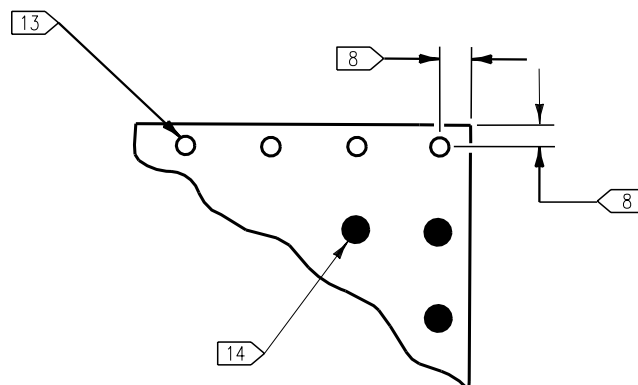
BLIND FASTENERS 1 ▶ 2 ▶			
FLUSH			
MCDONNELL NO.	MATERIAL THICKNESS 3 ▶	EDGE DISTANCE	SPACING
NAS1399C4A( )	0.063	0.28	0.50 To 0.55
NAS1399C4A( )	0.071	0.28	0.50 To 0.55
NAS1399C5A( )	0.080	0.35	0.62 To 0.68
NAS1399C5A( )	0.090	0.35	0.62 To 0.68
NAS1399C6A( )	0.100	0.41	0.75 To 0.83
NAS1399C6A( )	0.125	0.41	0.75 To 0.83
PROTRUDING			
NAS1398C4A( )	0.012	0.28	0.50 To 0.55
NAS1398C4A( )	0.020	0.28	0.50 To 0.55
NAS1398C4A( )	0.025	0.28	0.50 To 0.55

Table 5. Fastener Selection For Titanium Repairs in Inlet Areas (Continued)

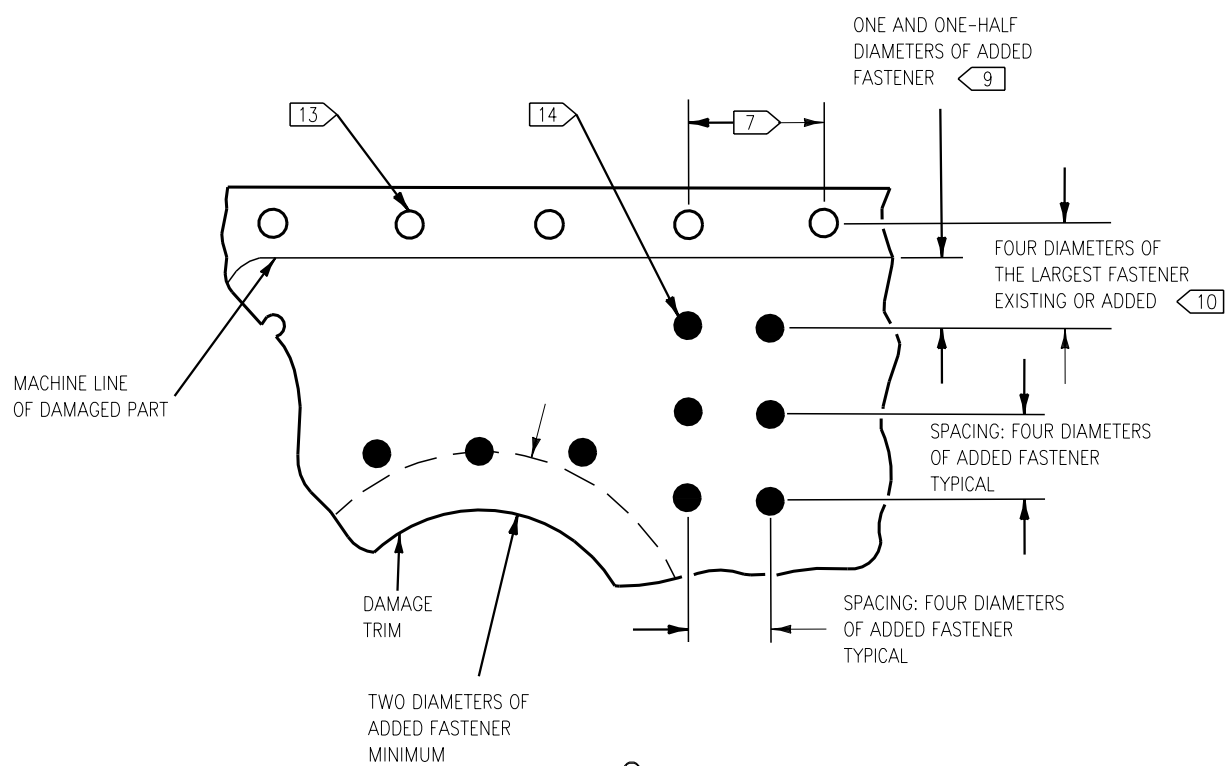
BLIND FASTENERS <input type="checkbox"/> 1 <input type="checkbox"/> 2			
FLUSH			
MCDONNELL NO.	MATERIAL THICKNESS <input type="checkbox"/> 3	EDGE DISTANCE	SPACING
NAS1398C4A( )	0.032	0.28	0.50 To 0.55
NAS1398C4A( )	0.040	0.28	0.50 To 0.55
NAS1398C4A( )	0.050	0.28	0.50 To 0.55
NAS1398C5A( )	0.063	0.35	0.62 To 0.68
NAS1398C5A( )	0.071	0.35	0.62 To 0.68
NAS1398C5A( )	0.080	0.35	0.62 To 0.68
NAS1398C5A( )	0.090	0.35	0.62 To 0.68
NAS1398C5A( )	0.100	0.35	0.62 To 0.68
NAS1398C5A( )	0.125	0.35	0.62 To 0.68
<b>NOTE</b>  <input type="checkbox"/> 1 Blind fasteners are allowed in or near inlets only if fastener hole interior is not accessible and a blind fastener is the only alternate. <input type="checkbox"/> 2 Grip gage each hole to determine correct fastener length. Install fasteners wet with MIL-S-83430 (A1-F18AC-SRM-200, WP011 00). <input type="checkbox"/> 3 Based on bay thickness.			



**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 1)**



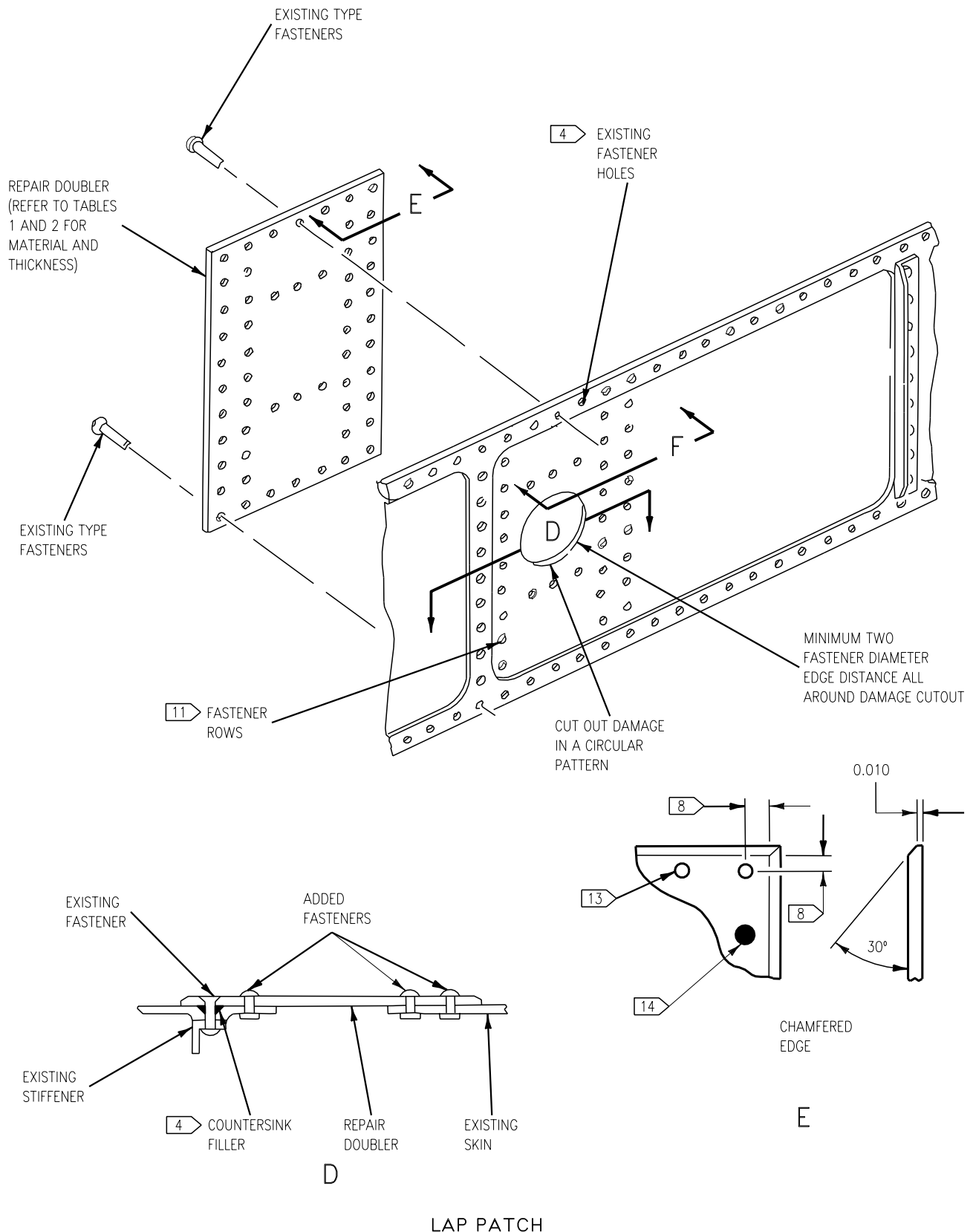
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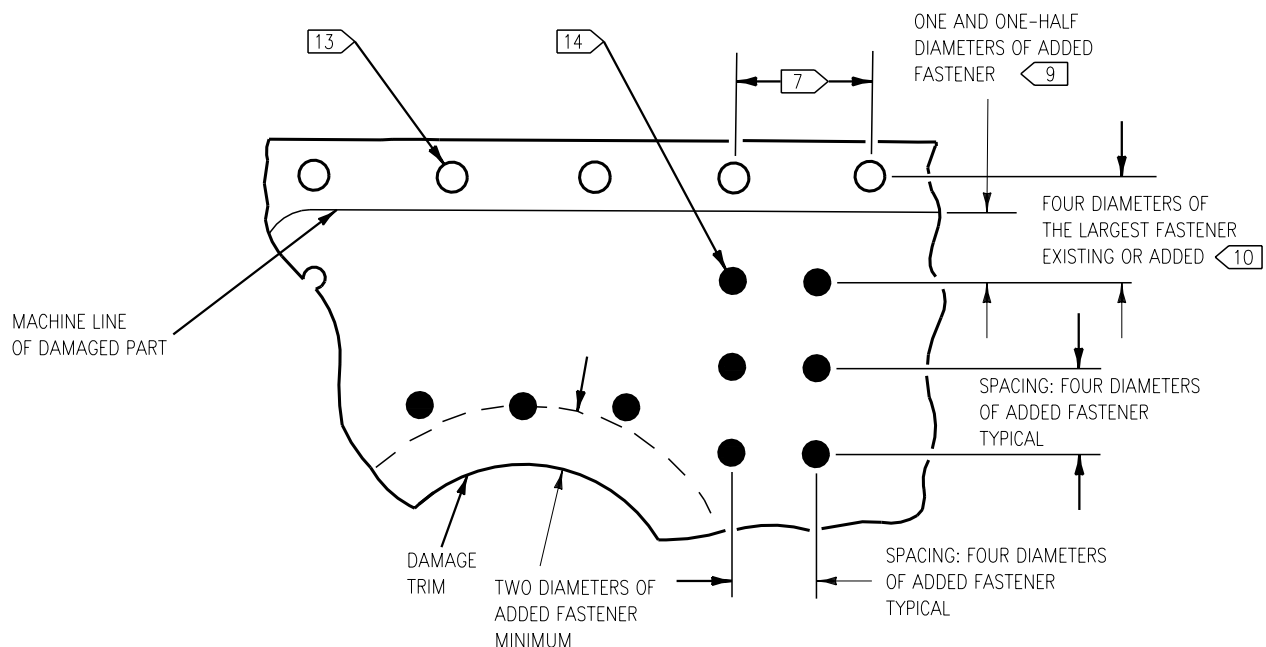
C

## FLUSH PATCH

**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 2)**



**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 3)**



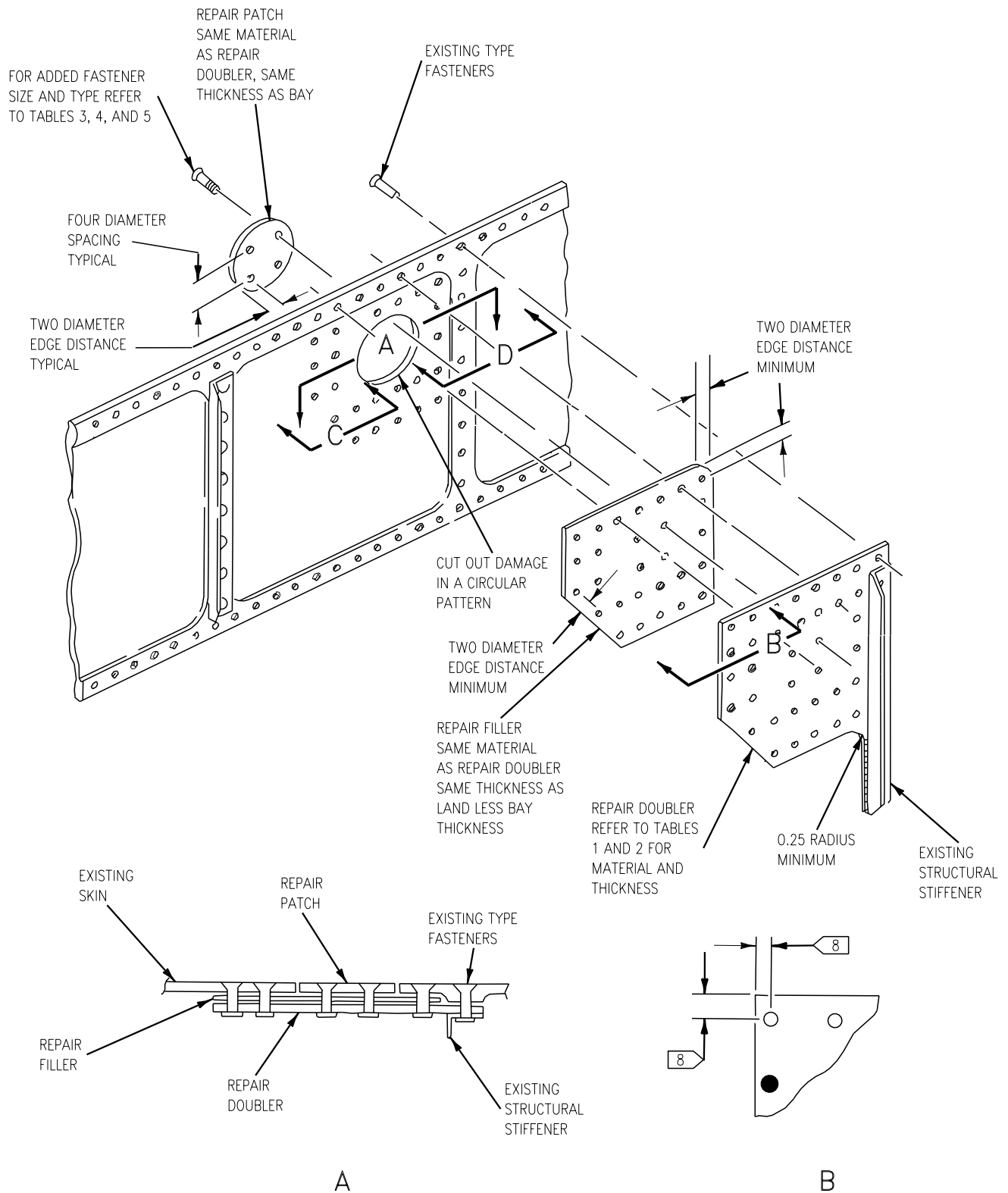
### F LEGEND

1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MACHINED STEPS.
- 4 ADD COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDLINE.
5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.
6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLES 3, 4, AND 5.
- 7 EXISTING FASTENER SPACING.
- 8 ONE-HALF EXISTING FASTENER SPACING.
- 9 ALL FASTENERS SHALL BE A MINIMUM OF ONE AND ONE-HALF DIAMETERS FROM ANY MACHINED LINE.
- 10 IF FOUR DIAMETERS SPACING PLACES THE FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM THE MACHINED LINE, RELOCATE THE FASTENER TO COMPLY WITH NOTE NINE.
- 11 TWO ROWS OF FASTENERS REQUIRED, THIS ROW MAY BE ON THE OTHER SIDE OF THE LAND WITH THE REQUIRED ADDITIONAL FILLER.
- 12 LOCATION AND SPACING TO MATE WITH ORIGINAL SKIN AND REPAIR SKIN.
- 13 ○ -EXISTING FASTENER.
- 14 ● -ADDED FASTENER.

### LAP PATCH

18AC-SRM-25-(55-4)36-CATI

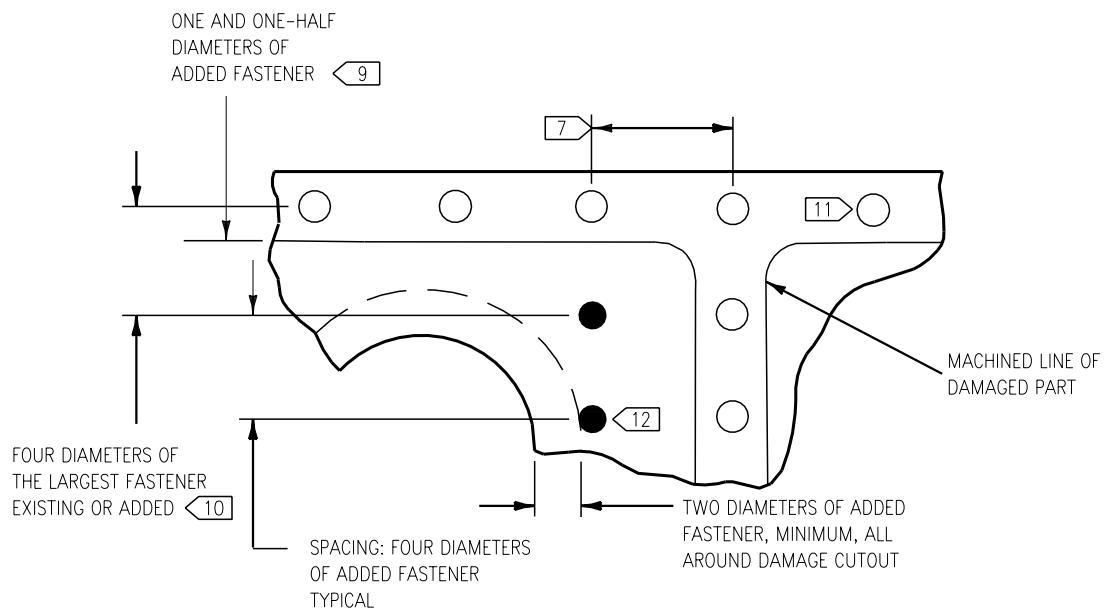
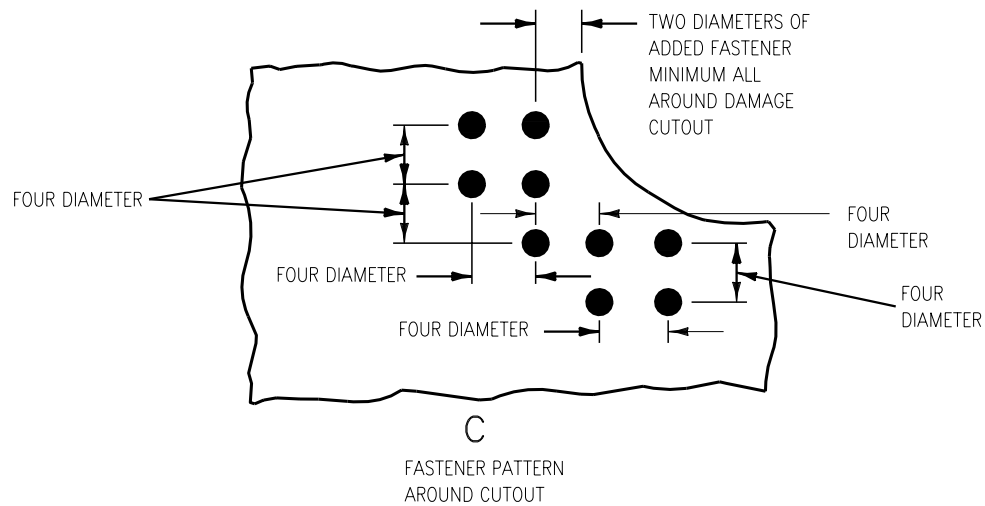
**Figure 1. Damage to Bay Requiring Repair Across Land (Sheet 4)**



FLUSH PATCH

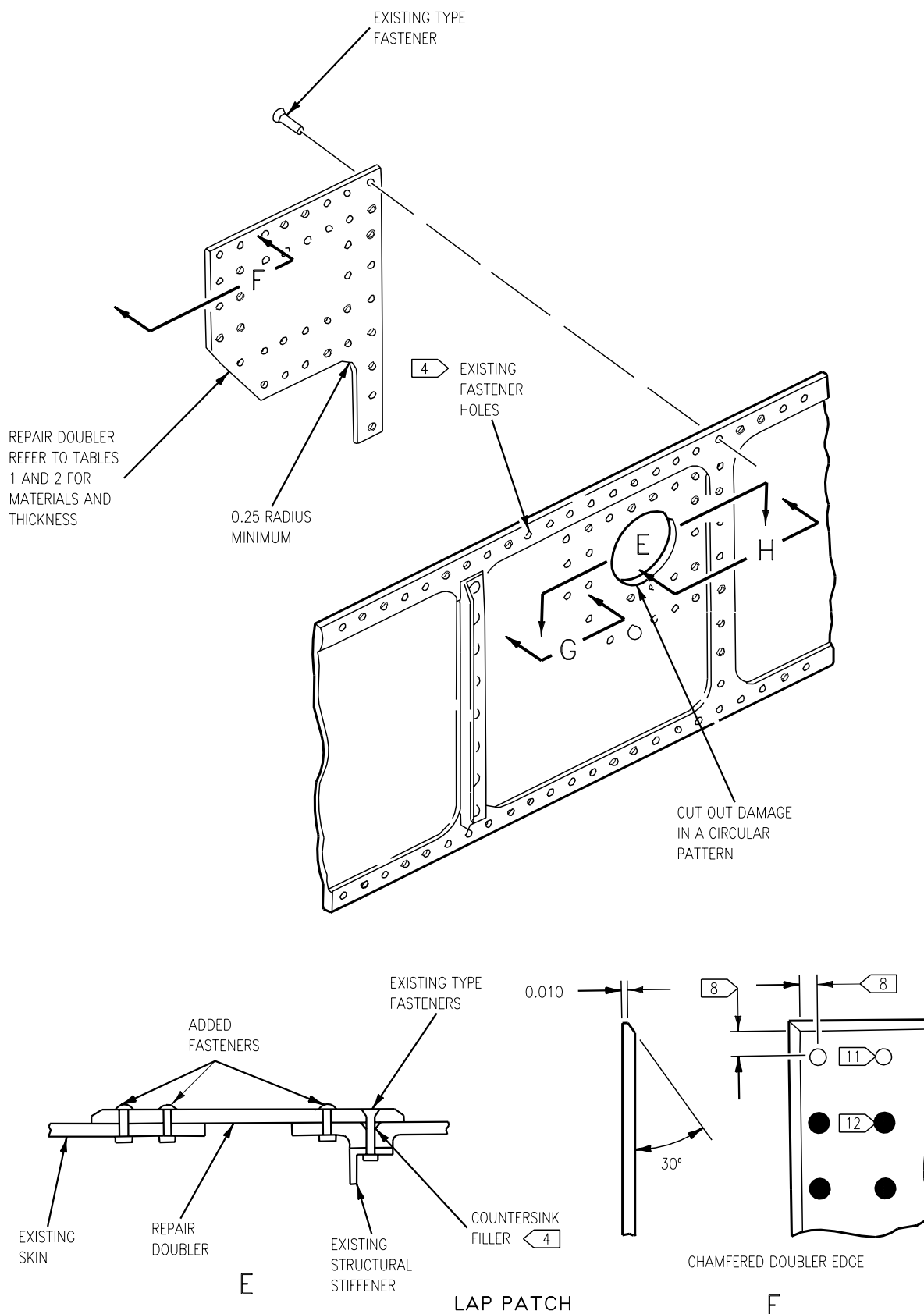
Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 1)

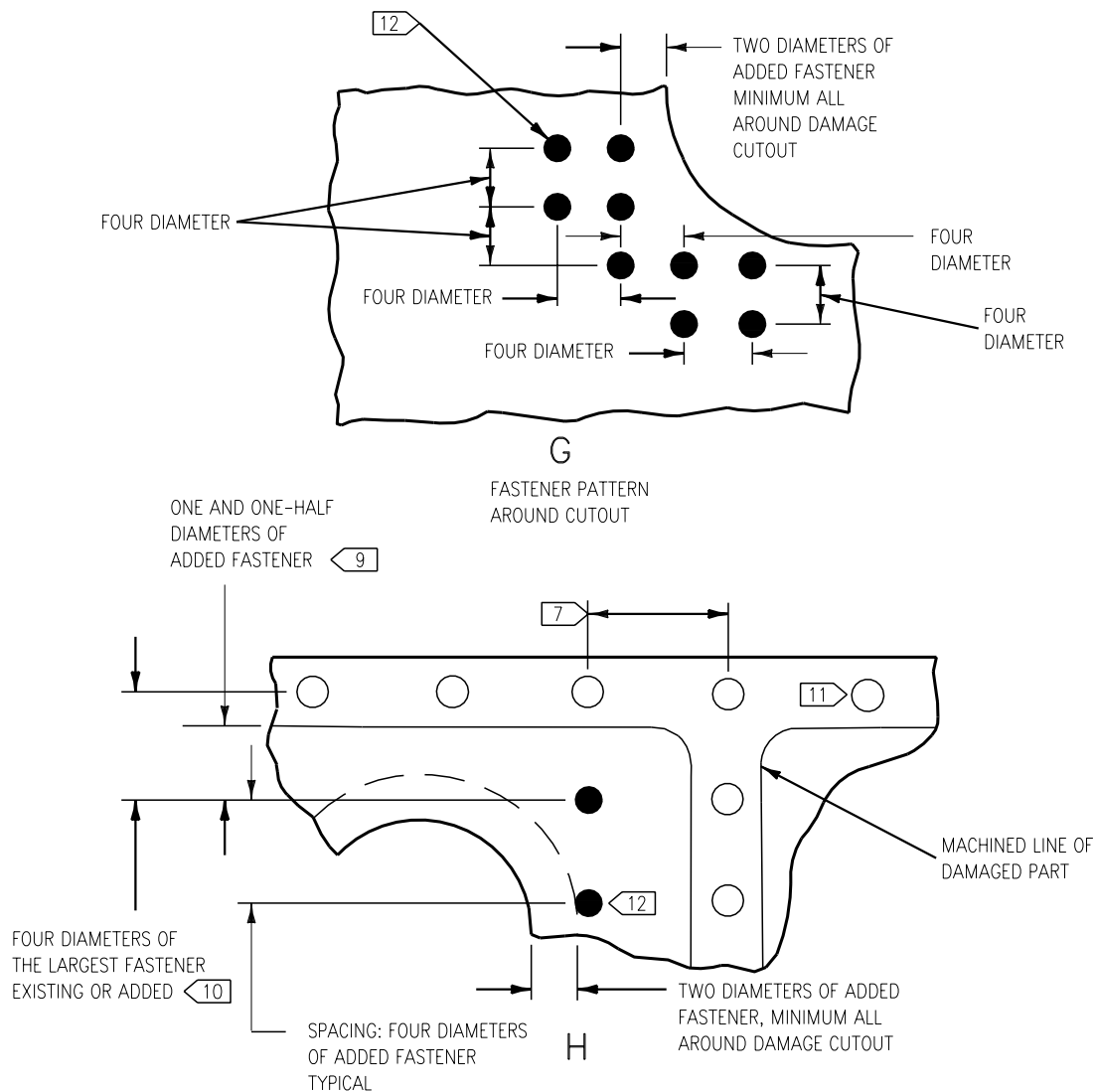




D  
FLUSH PATCH

Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 2)





1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.
2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.
3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MACHINED STEPS.

**4** ADD COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDLINE.

5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.

6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLE 3, 4, OR 5.

**7** EXISTING FASTENER SPACING.

**8** ONE-HALF EXISTING FASTENER SPACING.

**9** ALL FASTENERS SHALL BE A MINIMUM OF ONE AND ONE-HALF DIAMETERS FROM ANY MACHINED LINE.

**10** IF FOUR DIAMETERS SPACING PLACES THE FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM THE MACHINED LINE, RELOCATE THE FASTENER TO COMPLY WITH NOTE NINE.

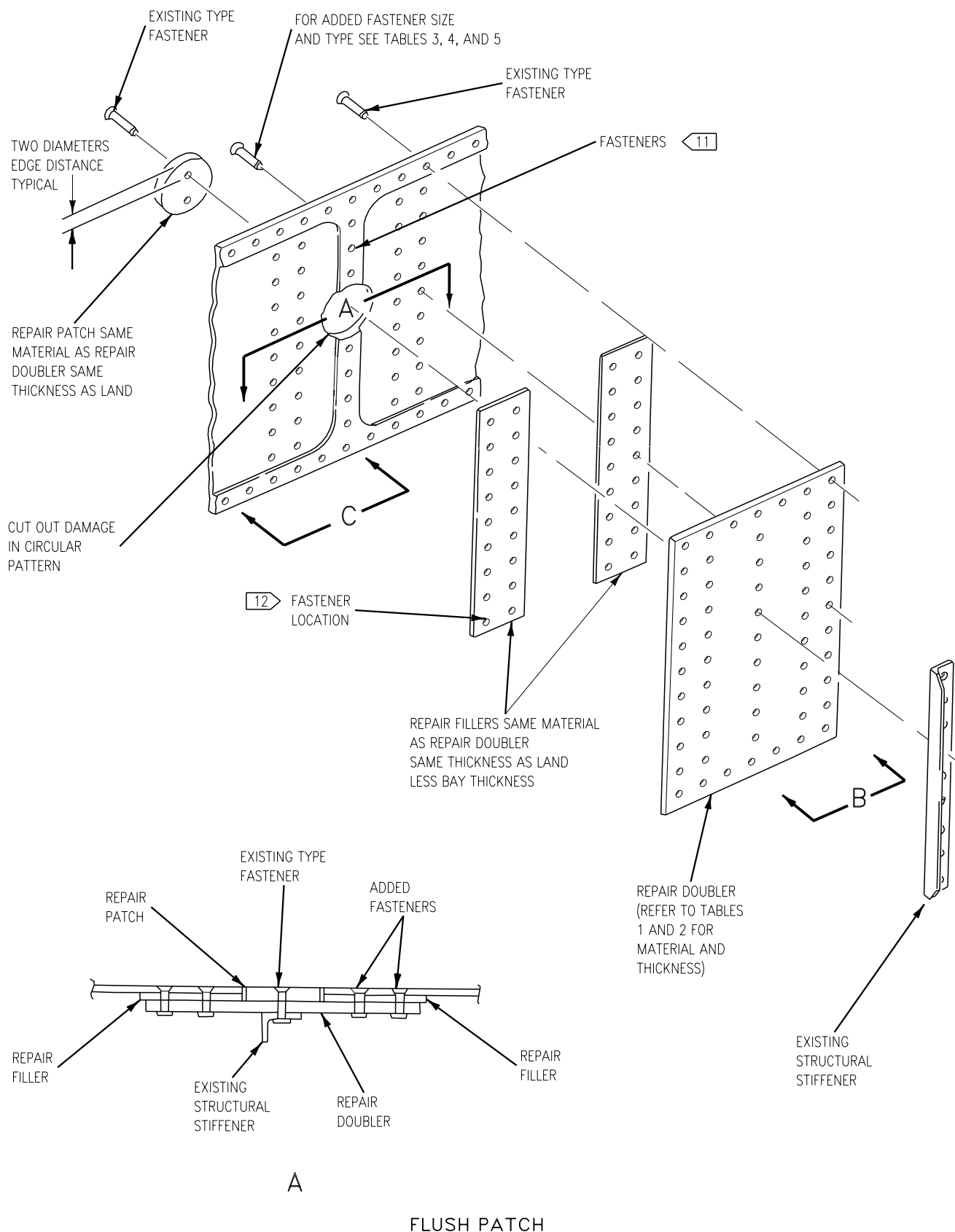
**11** ○ - EXISTING FASTENER.

**12** ● - ADDED FASTENER.

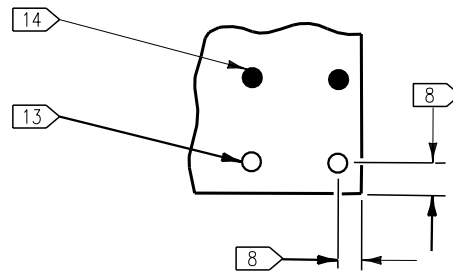
LAP PATCH

18AC-SRM-25-(56-4)36-CATI

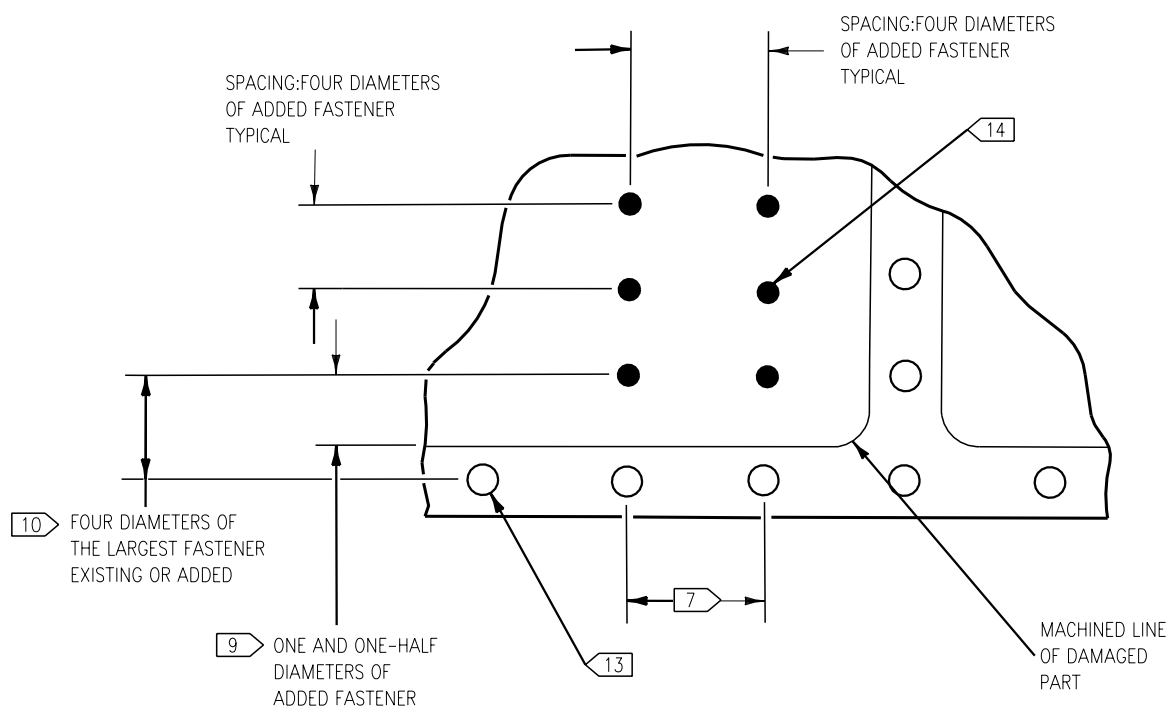
**Figure 2. Damage to Bay Requiring Repair Across Land and Edge of Part (Sheet 4)**



**Figure 3. Damage to Land, or Land and Bay (Sheet 1)**



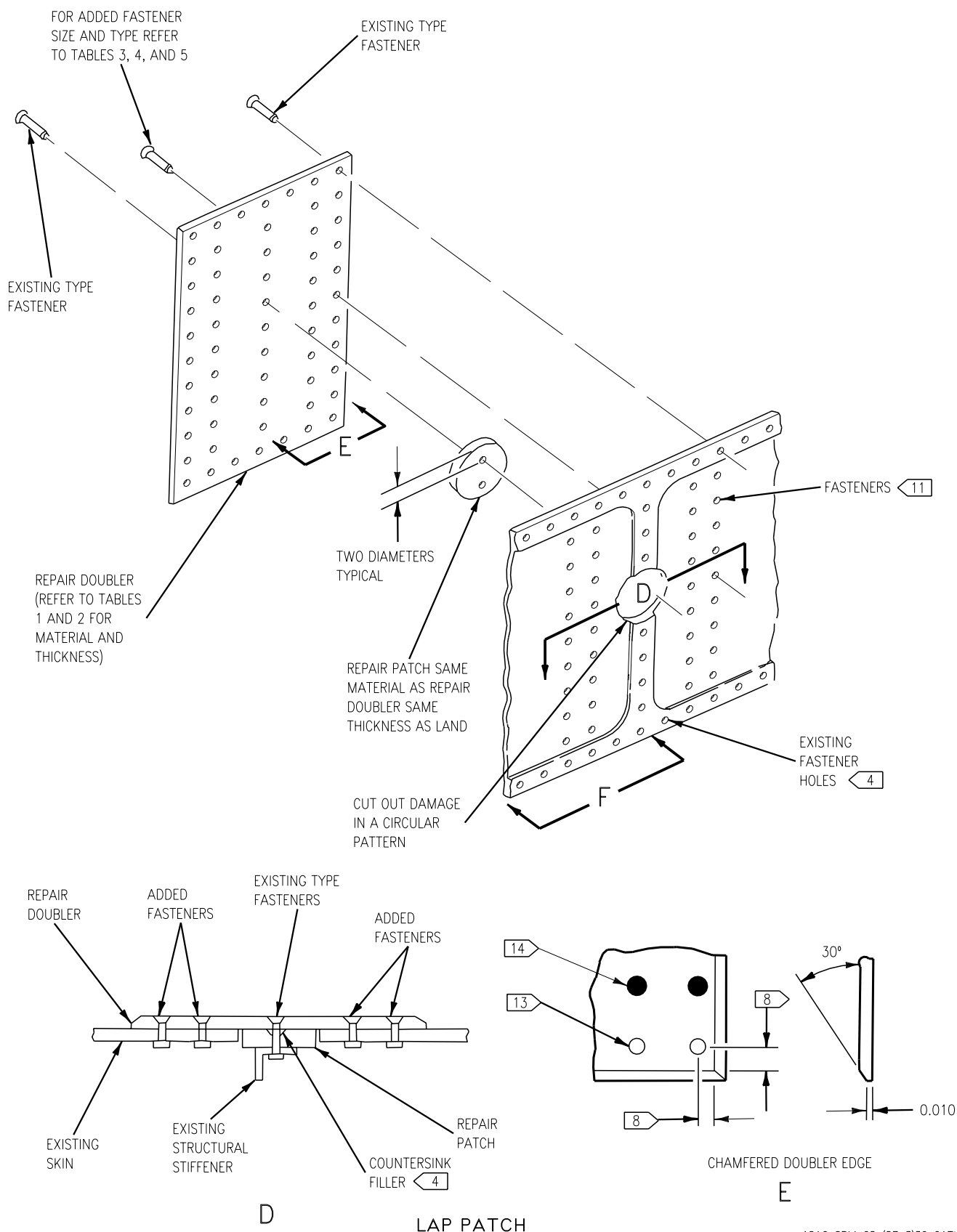
B



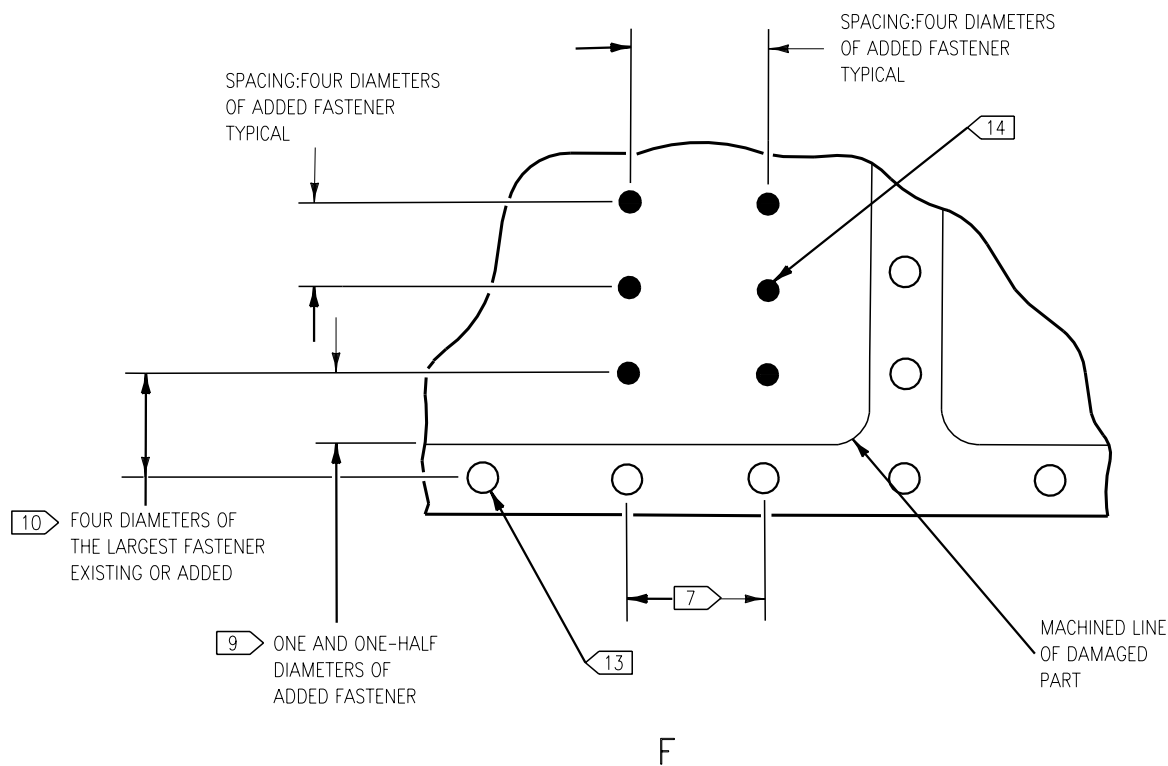
C

FLUSH PATCH

Figure 3. Damage to Land, or Land and Bay (Sheet 2)



**Figure 3. Damage to Land, or Land and Bay (Sheet 3)**



## LEGEND

- |   |  |
|---|--|
| <p>1. USE EXISTING SPACING AND EDGE DISTANCE IN EXISTING FASTENER ROWS.</p> <p>2. USE EXISTING FASTENER TYPES IN EXISTING FASTENER LOCATIONS.</p> <p>3. ALL FASTENERS MUST BE ONE AND ONE-HALF DIAMETERS MINIMUM FROM MACHINED STEPS.</p> <p>4 ADD COUNTERSINK FILLERS AS REQUIRED. MAKE SURE FILLERS COMPLETELY FILL COUNTERSINK AND ARE FLUSH WITH MOLDFINE.</p> <p>5. BASIC FASTENER SPACING SHALL BE FOUR DIAMETERS WITH TWO DIAMETERS EDGE DISTANCE.</p> <p>6. SHEET TO BE COUNTERSUNK MUST BE AS THICK AS MINIMUM REQUIRED PER TABLE 3, 4, OR 5.</p> <p>7 EXISTING FASTENER SPACING.</p> <p>8 ONE-HALF EXISTING FASTENER SPACING.</p> | <p>9 ALL FASTENERS SHALL BE A MINIMUM OF ONE AND ONE-HALF DIAMETERS FROM ANY MACHINED LINE.</p> <p>10 IF FOUR DIAMETERS SPACING PLACES THE FASTENER LESS THAN ONE AND ONE-HALF DIAMETERS FROM THE MACHINED LINE, RELOCATE THE FASTENER TO COMPLY WITH NOTE NINE.</p> <p>11 THREE FASTENERS MINIMUM ON EACH SIDE OF CUTOUT.</p> <p>12 LOCATION AND SPACING TO MATE WITH ORIGINAL SKIN AND REPAIR SKIN.</p> <p>13 ○ -EXISTING FASTENERS.</p> <p>14 ● -ADDED FASTENERS.</p> |
|---|--|

## LAP PATCH

Figure 3. Damage to Land, or Land and Bay (Sheet 4)

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## BLENDING

## Reference Material

Aircraft Corrosion Control.....	A1-F18AC-SRM-500
Cleaning.....	WP006 00
Stripping.....	WP007 00
Chemical Treatment.....	WP008 00
Priming Procedures .....	WP011 00
Finish System .....	WP012 00
Nondestructive Inspection.....	A1-F18AC-SRM-300
Penetrant Method.....	WP004 00

## Alphabetical Index

Subject	Page No.
Procedures.....	1
Alclad Surfaces .....	2
Non-Alclad Surfaces .....	2

## Record of Applicable Technical Directives

None

## 1. PROCEDURES.

2. The blending procedures are for non-alclad and alclad surfaces. Damages treated by these procedures are: scratches, nicks, gouges and corrosion.

## Support Equipment Required

None

## Materials Required

Specification or Part Number	Nomenclature
A-A-1047, GRIT 240-9X11, 320-9X11 400-9X11	Paper, Abrasive
MILA9962TY1CL1 GRAX9X11	Mat, Abrasive



## NOTE

Damage must be at least one fastener hole diameter from edge of any fastener.

### 3. NON-ALCLAD SURFACES. See figure 1.

a. Determine amount of damage by removing surface finish, (A1-F18AC-SRM-500, WP007 00).

b. Blend out damage to a minimum diameter or width of 20 times damage depth per substeps below.



At intervals, check to make sure repairable damage after blending depths are not exceeded during any clean, smooth or polish procedures. Blending depths exceeding established limits must be repaired per limitations outlined in applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

(1) Clean damaged area using 240 grit abrasive paper.

(2) Smooth damaged area using 320 grit abrasive paper.

## NOTE

If cracks exist, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

(3) Perform penetrant inspection to determine if a crack exists in damaged area (A1-F18AC-SRM-300, WP004 00).

(4) Polish damaged area using 400 grit abrasive paper.

c. Clean area (A1-F18AC-SRM-500, WP006 00).

d. Treat area for corrosion prevention, (A1-F18AC-SRM-500, WP008 00 and WP011 00).

e. Refinish area (A1-F18AC-SRM-500, WP012 00).

## NOTE

Damage must be at least one fastener hole diameter from edge of any fastener.

### 4. ALCLAD SURFACES. See figure 1.

a. Determine amount of damage by removing surface finish, (A1-F18AC-SRM-500, WP007 00).

b. Blend out damage to a minimum diameter or width of 20 times damage depth per substeps below.



At intervals, check to make sure repairable damage after blending depths are not exceeded during any clean, smooth or polish procedures. Blending depths exceeding established limits must be repaired per limitations outlined in applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

(1) Clean damaged area using abrasive mat.

(2) Smooth damaged area using abrasive mat.

## NOTE

If cracks exist, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

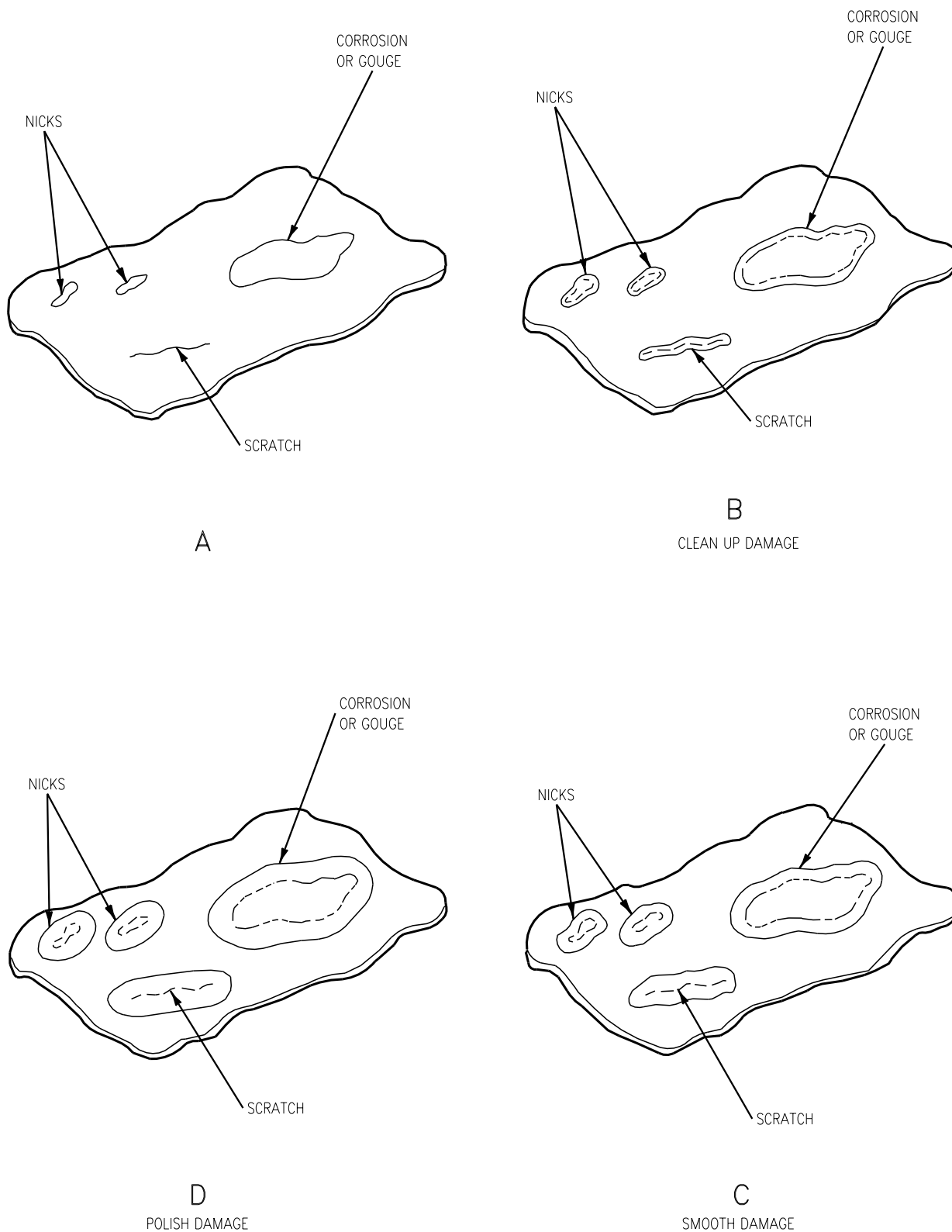
(3) Perform penetrant inspection to determine if a crack exists in damaged area (A1-F18AC-SRM-300, WP004 00).

(4) Polish damaged area using abrasive mat.

c. Clean area (A1-F18AC-SRM-500, WP006 00).

d. Treat area for corrosion prevention, (A1-F18AC-SRM-500, WP008 00 and WP011 00).

e. Refinish area (A1-F18AC-SRM-500,  
WP012 00).



**Figure 1. Blending**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS I DAMAGE REPAIR

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

## Alphabetical Index

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required (Continued)

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
74D110172-1001	Tool Set - Structural Repair, Composite Materials	CCC-C-440 TYPE 1, CLASS 1	Cheesecloth
		200SG40TR	Plastic Sheet
		A-A-1047, GRIT 180-9X11	Paper, Abrasive
		240-9X11	
		A-A-883, TYPE 1, 1/4 IN, 1 IN	Tape, Pressure Sensitive

## Materials Required

Specification or Part Number	Nomenclature
EA956 A/B	Adhesive
H-B-695 TYPE 1 GRADE A SIZE 1-1/2	Brush, Varnish



Use care when removing surface finish  
not to damage base material of skin.

- a. Mask off skin and remove finish 3 inches  
each direction from damage. Smooth out sharp  
edges using 180 grit abrasive paper.

b. Clean area by wiping with clean dry cheesecloth.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

c. Prepare adhesive (WP003 00).

d. Brush apply adhesive, filling damaged area to mold line. Add excess adhesive to allow for shrinkage.

e. Cover adhesive with plastic sheet. Work out any trapped air.

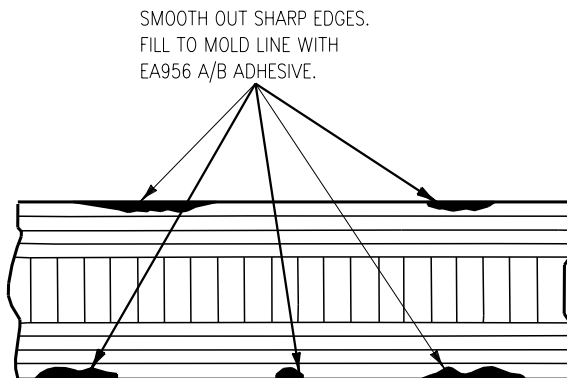
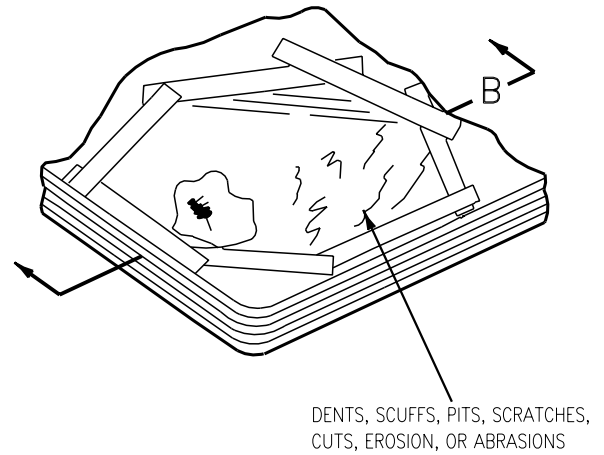
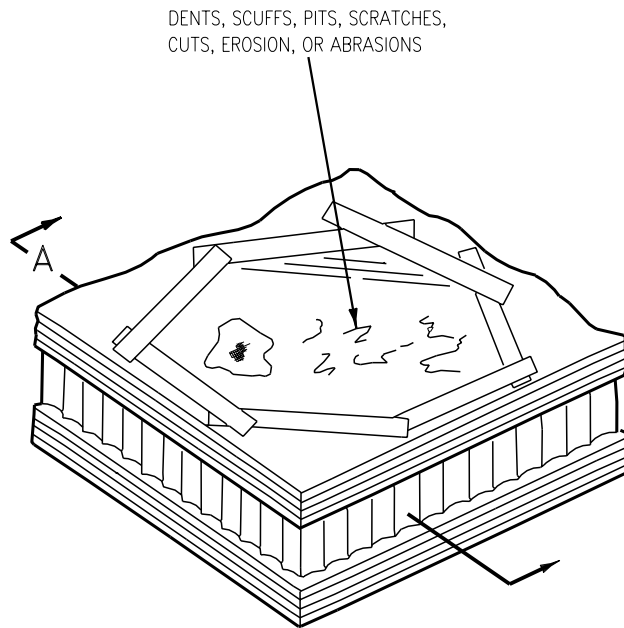
f. Cure adhesive (WP004 00).

g. Remove plastic sheet and tape.

## CAUTION

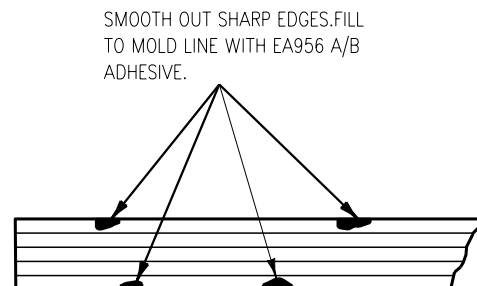
Use care not to sand into skin plies causing extra damage.

h. Sand surface smooth using 240 grit abrasive paper.



**A**

FIBERGLASS OR ARAMID SKIN  
WITH HONEYCOMB CORE



**B**

FIBERGLASS OR ARAMID SKIN

**Figure 1. Class I Damage Repair**



## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS II DAMAGE REPAIR

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

## Alphabetical Index

Subject	Page No.
Broken or Missing Fibers at Fastener Hole .....	1
Chipped, Broken, or Crushed Edge .....	2

## Record of Applicable Technical Directives

None

## 1. BROKEN OR MISSING FIBERS AT FASTENER HOLE. See figure 1, detail A.

## Materials Required (Continued)

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature	—	Glass Floc, 0.070 ±0.040 Inch Glass Fibers
		CCC-C-440 TYPE 1, CLASS 1	Cheesecloth
74D110172-1001	Tool Set - Structural Repair, Composite Materials	200SG40TR	Plastic Sheet
		A-A-1047, GRIT 180-9X11 240-9X11	Paper, Abrasive
Materials Required		GG-D-223	Metal Spatula
Specification or Part Number	Nomenclature	A-A-883, TYPE 1, 1/4 IN, 1 IN	Tape, Pressure Sensitive
		EA956 A/B	Adhesive



**CAUTION**

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches in each direction from damage using 180 grit abrasive paper.

b. Remove damaged area to a circular configuration.

**CAUTION**

Use care when sanding not to damage remaining plies.

c. Smooth area of damage using 180 grit abrasive paper.

d. Clean cutout area by wiping with clean dry cheesecloth.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

e. Prepare adhesive (WP003 00). Add glass floc to prepared adhesive to get a putty-like consistency.

f. Use a spatula to fill damaged area flush to mold line with adhesive. Add excess adhesive to allow for shrinkage.

g. Cover adhesive with plastic sheet.

h. Cure adhesive (WP004 00).

i. Remove plastic sheet.

**CAUTION**

Use care not to sand into skin plies causing extra damage.

j. Sand surface smooth using 240 grit abrasive paper.

k. Redrill and/or recountersink fastener hole as required.

## 2. CHIPPED, BROKEN, OR CRUSHED EDGE. See figure 1, detail B.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set -
	Structural Repair,
	Composite Materials
1/8-Inch Thick,	Metal Backing Plate
Size as Required	
to Cover Repair	

### Materials Required

Specification or Part Number	Nomenclature
EA956 A/B	Adhesive
—	Glass Floc,
	0.070 ±0.040 Inch
	Glass Fibers
200SG40TR	Plastic Sheet
A-A-1047, GRIT	Paper, Abrasive
180-9X11	
240-9X11	
GG-D-223	Metal Spatula
855-1-000 IN.	Pressure Sensitive
	Tape
A-A-883, TYPE 1	Tape, Pressure
1/4 IN,	Sensitive
1 IN	



Use care when removing surface finish not to damage base material of skin.

- a. Mask off skin and remove finish 3 inches in each direction from damage.
- b. Trim out damage.



Use care not to sand into skin plies causing extra damage.

- c. Smooth area of damage using 180 grit abrasive paper.
- d. Vacuum clean repair area.
- e. Fabricate backing plates to cover damaged area. Cover backing plates with plastic sheet.
- f. Position backing plates to required dimension and secure in place with pressure sensitive tape.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- g. Prepare adhesive (WP003 00). Add glass floc to prepared adhesive to get a putty-like consistency.

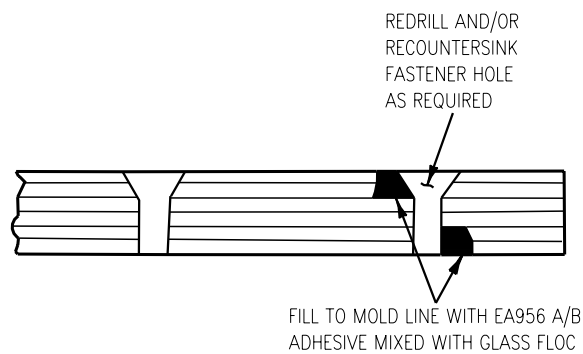
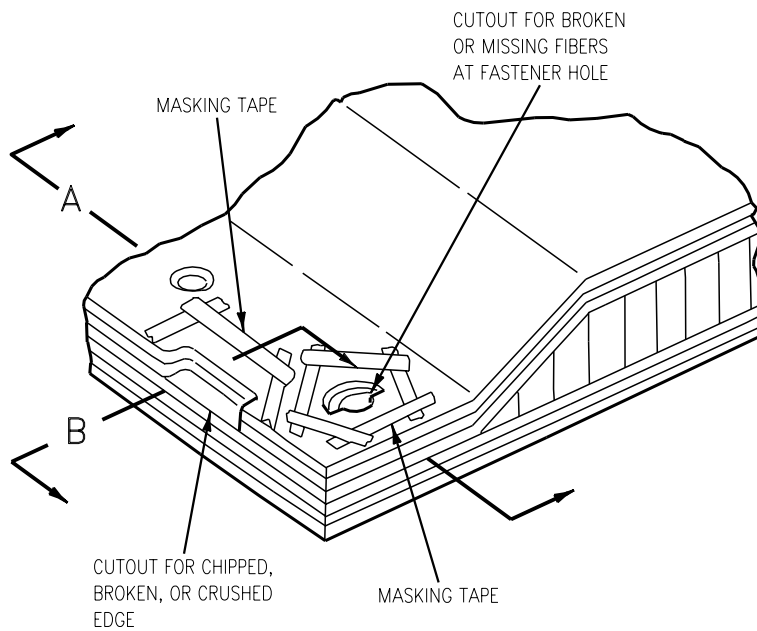
h. Fill repair with adhesive using a spatula. Work adhesive thoroughly into repair to avoid air pockets. Trowel smooth leaving excess adhesive above mold line to allow for shrinkage.

- i. Cover adhesive with plastic sheet.
- j. Cure adhesive (WP004 00).
- k. Remove backing plates and plastic sheet.

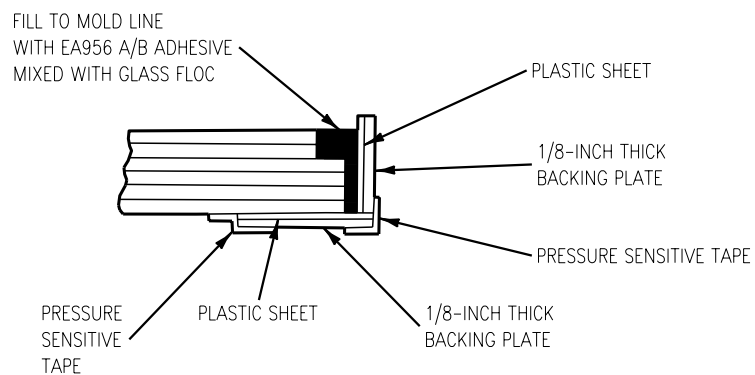


Use care not to sand into skin plies causing extra damage.

- l. Sand surface smooth with adjacent structure using 240 grit abrasive paper.



A



B

**Figure 1. Class II Damage Repair**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS III DAMAGE REPAIR

This WP supersedes WP041 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Nondestructive Inspection .....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core .....	WP008 01
Pulse Echo, Longitudinal Wave, Contact, Without Delay Line, For Composite Laminate Material .....	WP008 02

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Subject	Page No.
Cuts, Scratches, Scuffs, Nicks, and Gouges .....	1
Delamination Not Open to Edge .....	3

## Record of Applicable Technical Directives

None

1. CUTS, SCRATCHES, SCUFFS, NICKS,  
AND GOUGES. See figure 1, details A or C.

Support Equipment Required		Materials Required	
Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
		EA956	Adhesive
		—	Glass Floc, 0.070 ±0.040 Inch Glass Fibers
		CCC-C-440 TYPE 1	Cheesecloth
		CLASS 1	
74D110172-1001	Tool Set - Structural Repair, Composite Materials	200SG40TR	Plastic Sheet
		GG-D-223	Metal Spatula
		TEMP-R-GLAS 6TB	Cloth, Teflon

**Materials Required (Continued)**

Specification or Part Number	Nomenclature
A-A-883, TYPE 1 1/4 IN, 1 IN	Tape, Pressure Sensitive
A-A-1047 GRIT 180-9X11 240-9X11	Paper, Abrasive
MIL-C-9084, TYPE 8, CLASS 2	Cloth, Satin
MIL-C-9084, TYPE 3, CLASS 2	Cloth, Satin
020X413	Cleaning Compound

**CAUTION**

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches each direction from damage. Smooth out damage using 180 grit abrasive paper.

b. Clean area by wiping with clean dry cheesecloth.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

c. Prepare adhesive (WP003 00). Add glass floc to prepared adhesive to get a putty-like consistency.

d. Fill damaged area with adhesive using a spatula. Work adhesive thoroughly into repair to avoid air pockets.

e. Trowel level with surface. Add excess adhesive to allow for shrinkage.

f. Cover adhesive with plastic sheet.

g. Cure adhesive (WP004 00).

h. Remove plastic sheet.

**CAUTION**

Use care not to sand into skin plies causing extra damage.

i. Sand surface smooth using 240 grit abrasive paper.

j. Do NDI to make sure repair is filled (A1-F18AC-SRM-300, WP008 01 or WP008 02). If not filled, reclassify the damage. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

k. Clean area by wiping with clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes.

**NOTE**

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

l. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

m. Get two plies of satin cloth. Cut first ply to maintain 1/2-inch overlap around periphery of

repair. Cut second ply to maintain 1/4-inch step inside periphery of first ply of satin cloth. See figure 1.

### WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

n. Prepare adhesive (WP003 00).

### NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

o. Place first ply of satin cloth on clean layup table. Spread adhesive thoroughly impregnating satin cloth using a squeegee.

p. Spread thin layer of adhesive over repair surface.

q. Lay up impregnated satin cloth over repair. Maintain 1/2-inch overlap around periphery of repair. See figure 1.

r. Repeat step o for second ply of satin cloth.

s. Lay up impregnated satin cloth over first ply. Maintain 1/4-inch step inside periphery of first ply. See figure 1.

t. Cover repair with plastic sheet. Workout air bubbles and excess adhesive.

u. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

### CAUTION

Use care not to sand into skin plies causing extra damage.

v. Sand area lightly using 240 grit abrasive paper to remove surface roughness.

w. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01 or WP008 02). If damage is not repaired, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

## 2. DELAMINATION NOT OPEN TO EDGE.

See figure 1, details B or C.

## Support Equipment Required

### Part Number or Type Designation

### Nomenclature

74D110172-1001

Tool Set -  
Structural Repair,  
Composite Materials

## Materials Required

### Specification or Part Number

### Nomenclature

EA956

Adhesive  
Glass Floc,  
0.070 ±0.040 Inch  
Glass Fibers

CCC-C-440 TYPE 1  
CLASS 1

Cheesecloth

200SG40TR

Plastic Sheet

GG-D-223

Metal Spatula

TEMP-R-GLAS 6TB

Cloth, Teflon

A-A-883, TYPE 1

Tape, Pressure  
Sensitive

1/4 IN,  
1 IN

A-A-1047 GRIT

Paper, Abrasive

180-9X11

240-9X11

MIL-C-9084,

Cloth, Satin

TYPE 8, CLASS 2

MIL-C-9084,

Cloth, Satin

TYPE 3, CLASS 2

020X413

Cleaning Compound

## CAUTION

Use care when removing surface finish not to damage base material of skin.

- a. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper.
- b. Remove damaged area to a circular configuration using X-acto knife or equivalent.
- c. Remove burrs or chips from damaged area using vacuum cleaner.
- d. Clean area by wiping with clean dry cheesecloth.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- e. Prepare adhesive (WP003 00). Add glass floc to prepared adhesive to get a putty-like consistency.
- f. Fill damaged area with adhesive using a spatula. Work adhesive thoroughly into repair to avoid air pockets.
- g. Trowel level with surface. Add excess adhesive to allow for shrinkage.
- h. Cover adhesive with plastic sheet.
- i. Cure adhesive (WP004 00).
- j. Remove plastic sheet.

## CAUTION

Use care not to sand into skin plies causing extra damage.

- k. Sand surface smooth using 240 grit abrasive paper.

l. Do NDI to make sure repair is filled (A1-F18AC-SRM-300, WP008 01 or WP008 02). If not filled, reclassify the damage. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

## WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

m. Clean area by wiping with clean cheesecloth moistened with cleaning compound. Allow to air dry 15 minutes.

## NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

n. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

o. Get two plies of satin cloth. Cut first ply to maintain 1/2-inch overlap around periphery of repair. Cut second ply to maintain 1/4-inch step inside periphery of first ply of satin cloth. See figure 1.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- p. Prepare adhesive (WP003 00).

## NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

- q. Place first ply of satin cloth on clean layup table.

- r. Spread adhesive thoroughly impregnating satin cloth using a squeegee.

- s. Spread thin layer of adhesive over repair surface.

- t. Lay up impregnated satin cloth over repair. Maintain 1/2-inch overlap around periphery of repair. See figure 1.

- u. Repeat steps q and r for second ply of satin cloth.

- v. Lay up impregnated satin cloth over first ply. Maintain 1/4-inch step inside periphery of first ply. See figure 1.

- w. Cover repair with plastic sheet. Workout air bubbles and excess adhesive.

- x. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

## CAUTION

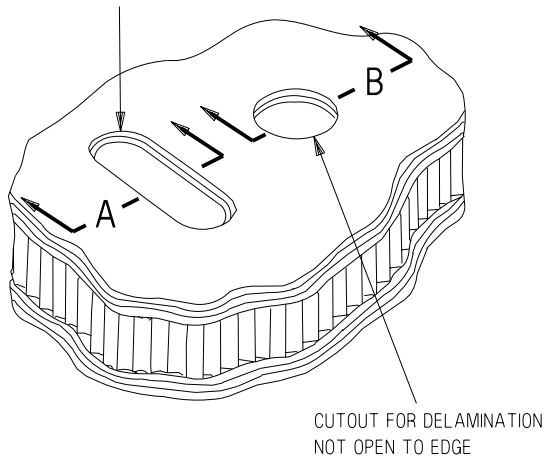
Use care not to sand into repair plies causing extra damage.

- y. Sand area lightly using 240 grit abrasive paper to remove surface roughness.

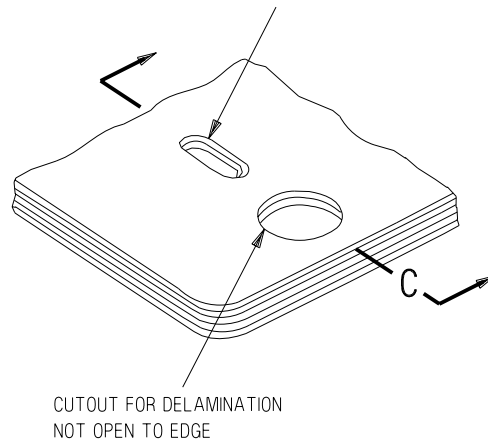
- z. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01 or WP008 02). If damage is not repaired, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.



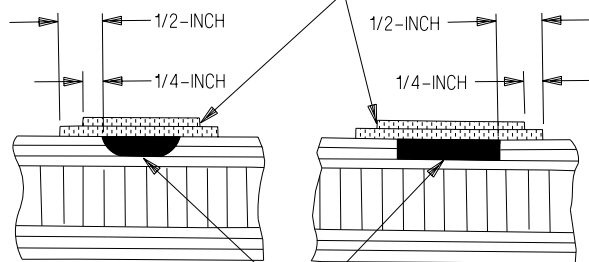
SMOOTH OUT CUTS, CRACKS, SCRATCHES,  
SCUFFS, NICKS, AND GOUGES USING 180  
GRIT ABRASIVE PAPER



SMOOTH OUT  
CUTS, SCRATCHES, SCUFFS,  
NICKS, CRACKS, AND GOUGES USING  
180 GRIT ABRASIVE PAPER



LAY UP WITH TYPE 3 OR  
TYPE 8 SATIN CLOTH  
IMPREGNATED WITH ADHESIVE

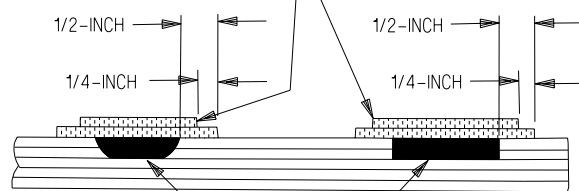


FILL TO MOLD LINE  
USING ADHESIVE MIXED  
WITH GLASS FLOC

A

B

LAY UP WITH TYPE 3 OR  
TYPE 8 SATIN CLOTH  
IMPREGNATED WITH ADHESIVE



FILL TO MOLD LINE  
USING ADHESIVE MIXED  
WITH GLASS FLOC

C

Figure 1. Class III Damage Repair

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS IV DAMAGE REPAIR

This WP supersedes WP042 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00

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## Record of Applicable Technical Directives

None

1. **DELAMINATION OPEN TO EDGE.** See figure 1, details A, C or E.

## Materials Required (Continued)

## Support Equipment Required

Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials
—	Hot Air Gun

Specification  
or Part Number

## Nomenclature

CCC-C-440 TYPE 1 CLASS 1 855-1.000 IN	Cheesecloth
A-A-1047 GRIT 240-9X11	Pressure Sensitive Tape
GG-N-196	Paper, Abrasive
1/8-Inch Thick, Size as Required to Cover Repair	Hypodermic Syringe, No. 15
420	Metal Backup Plates
	Sealant Gun Nozzle

## Materials Required

Specification or Part Number	Nomenclature
---------------------------------	--------------

EA956 Adhesive

a. Remove burrs or chips from damaged area using vacuum cleaner.

b. Clean area by wiping with clean dry cheesecloth.

c. Tape separated edge of damaged areas leaving a small opening at each end.

### WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Prepare adhesive (WP003 00).

### CAUTION

Temperature in excess of 150°F can cause damage to skin.

e. To aid adhesive flow, preheat repair area to a temperature not exceeding 150°F using a hot air gun.

f. Fill hypodermic syringe with adhesive.

g. Insert needle into edge of delamination.

h. Inject adhesive into delamination until it flows clear.

i. Wipe off excess adhesive with clean dry cheesecloth.

j. Cover openings with tape.

k. Apply pressure to repair using C-clamp and backup plates.

l. Cure adhesive (WP004 00).

m. Remove C-clamp, backup plates, and tape.

### CAUTION

Use care not to sand into skin plies causing extra damage.

n. Sand edge smooth using abrasive paper.

## 2. DELAMINATION AT FASTENER HOLE.

See figure 1, details B, D or F.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials
—	Hot Air Gun

### Materials Required

#### NOTE

Alternate item part numbers are shown indented.

Specification or Part Number	Nomenclature
EA956	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
020X413	Cleaning Compound
Camie A1000	Release Agent
S00311	Release Agent
GG-N-196H	Hypodermic Syringe No. 15
420	Sealant Gun Nozzle

a. Remove burrs and chips from damaged fastener hole using vacuum cleaner.

## WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

b. Clean fastener hole by wiping with clean cheesecloth moistened with cleaning compound.

c. Allow to air dry 15 minutes.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

d. Prepare adhesive (WP003 00).

## CAUTION

Temperature in excess of 150° F can cause damage to skin.

e. To aid adhesive flow, preheat repair area to a temperature not exceeding 150° F using a hot air gun.

f. Fill hypodermic syringe with adhesive.

g. Inject adhesive into damaged area.

## WARNING

Camie A1000 release agent is a flammable liquid and vapor. May cause allergic skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Use only with adequate ventilation. Avoid breathing dust (vapor, mist, gas). Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

S00311 release agent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

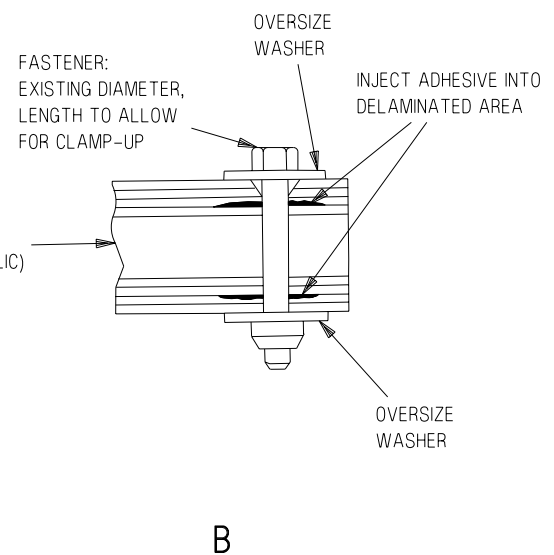
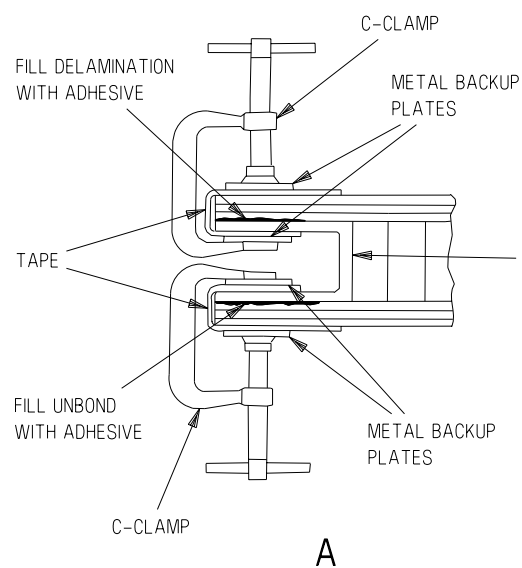
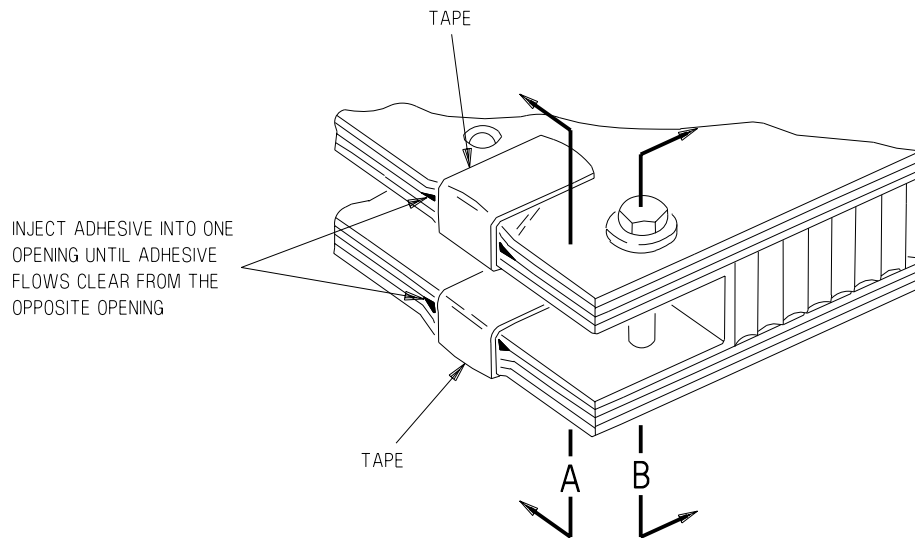
h. Apply release agent to fastener and oversize washers before installing.

i. Apply pressure to repair by installing existing diameter fastener with oversize washers, see details B, D, or F.

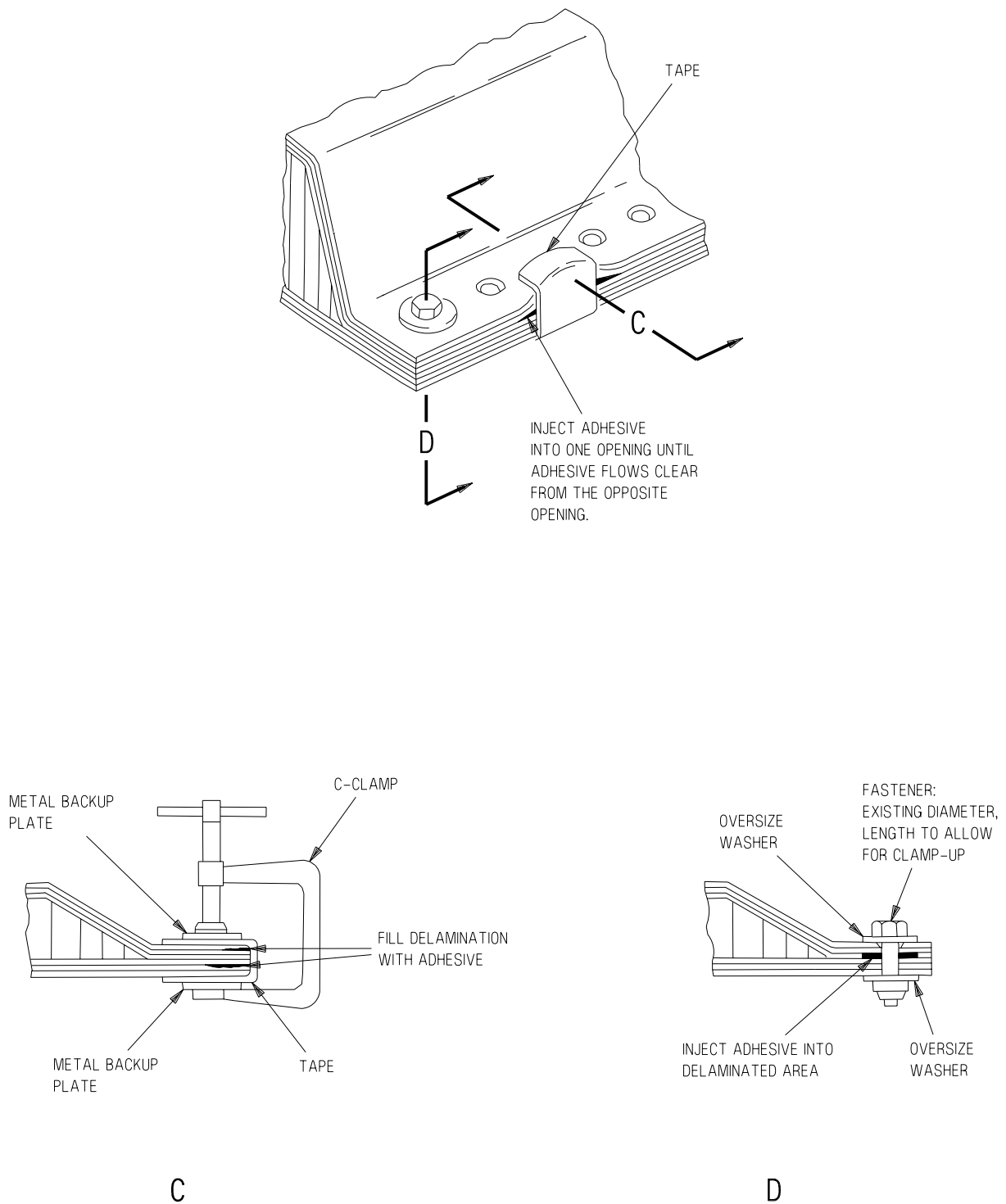
j. Cure adhesive (WP004 00).

k. Remove fastener and oversize washers.

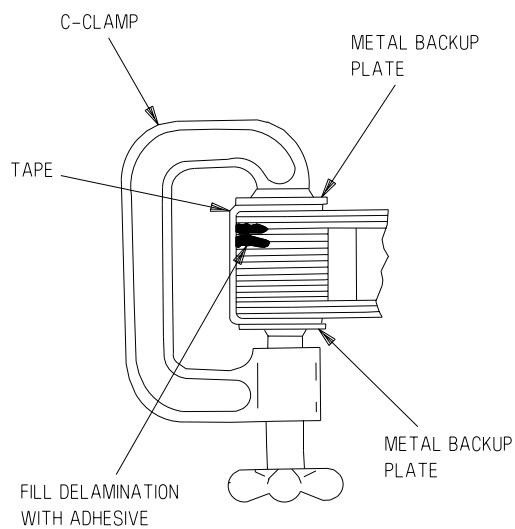
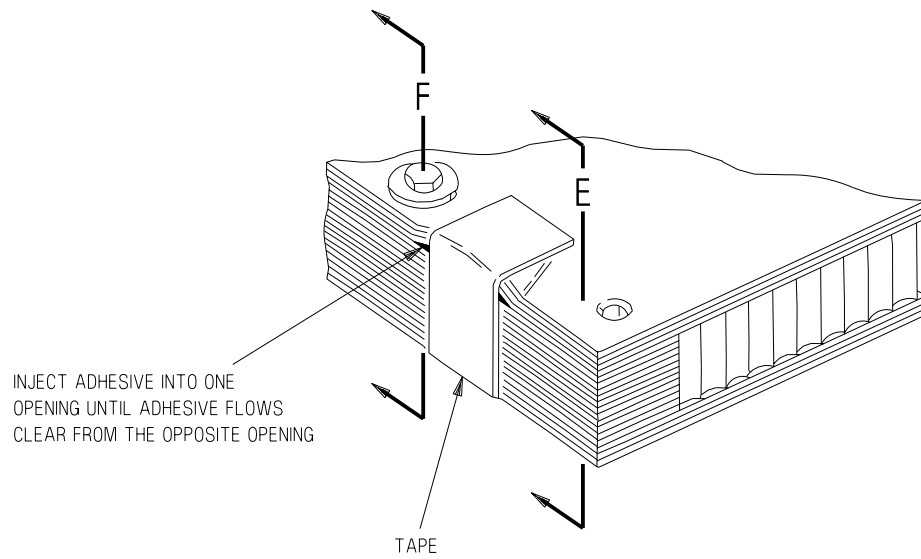
l. Redrill and/or re-countersink fastener hole to original size.



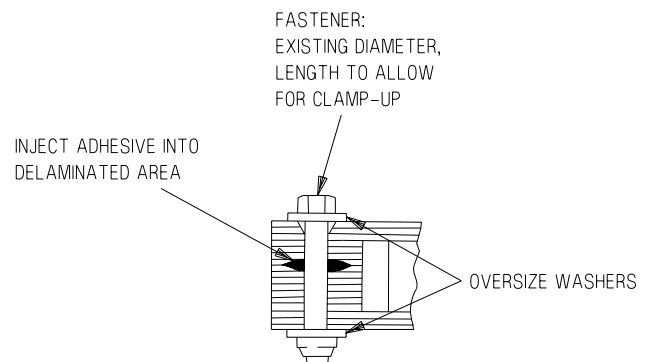
**Figure 1. Class IV Damage Repair (Sheet 1)**



**Figure 1. Class IV Damage Repair (Sheet 2)**



E



F

**Figure 1. Class IV Damage Repair (Sheet 3)**

## ORGANIZATIONAL MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS V DAMAGE REPAIR

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Nondestructive Inspection .....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core .....	WP008 01

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

2. This procedure is applicable to metallic and nonmetallic channels, ribs, or spars.

## Support Equipment Required

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
		EA956 A/B	Adhesive
		CCC-C-440, TYPE 1, CLASS 1	Cheesecloth
		855-1.000 IN.	Pressure Sensitive Tape
		450	Sealant Gun Nozzle
		A-A-1047, GRIT 240-9X11	Abrasive Paper
74D110172-1001	Tool Set - Structural Repair, Composite Materials	—	1/2-Inch Surgical Rubber or Plastic Tubing
538A	Air Regulator Assembly, with Oil-Water Separator and Gage	250-CP2-1/2	Sealant Cartridges



a. Drill 1/8-inch diameter hole at each end of unbond or void area. Minimum spacing between holes is 1/2-inch.

b. Vacuum clean any loose burrs and chips.

c. Make sure holes are located within unbond or void area per substeps below:

(1) Fit sealing nozzles into holes at each end of void or unbond. Tape over intermediate holes with pressure sensitive tape.

(2) Attach a piece of tubing to one nozzle and submerge other end in container of water.

(3) Attach other nozzle to sealant gun cartridge without plunger and place cartridge in sealant gun. Attach regulated source of compressed air to sealant gun.

(4) Apply pressure with air regulator set for 8 psi through sealant gun into void or unbond.

(5) Check water for bubbles to make sure air flow exists. If air flow exists, go to step d. If air flow does not exist, repeat steps a through c (4).

d. Remove nozzle from holes.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

e. Prepare adhesive (WP003 00).

f. Fill unbond or void area with adhesive per substeps below:

(1) Fill sealant gun with adhesive.

(2) Attach regulated source of compressed air to sealant gun. Set air regulator for 8 psi.

(3) Inject adhesive using sealant gun and nozzle into one hole and fill until adhesive flows clear from other hole.

(4) Wipe off excess adhesive with clean dry cheesecloth.

(5) Fill any unused holes with adhesive.

(6) Cover holes with tape.

g. Cure adhesive (WP004 00).

h. After cure, remove tape.



Be careful not to sand into channel, rib, or spar causing damage.

i. Sand area smooth using abrasive paper.

j. Do NDI to make sure unbond or void area is filled (A1-F18AC-SRM-300, WP008 01). If not filled, reclassify the damage. Refer to applicable A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual.

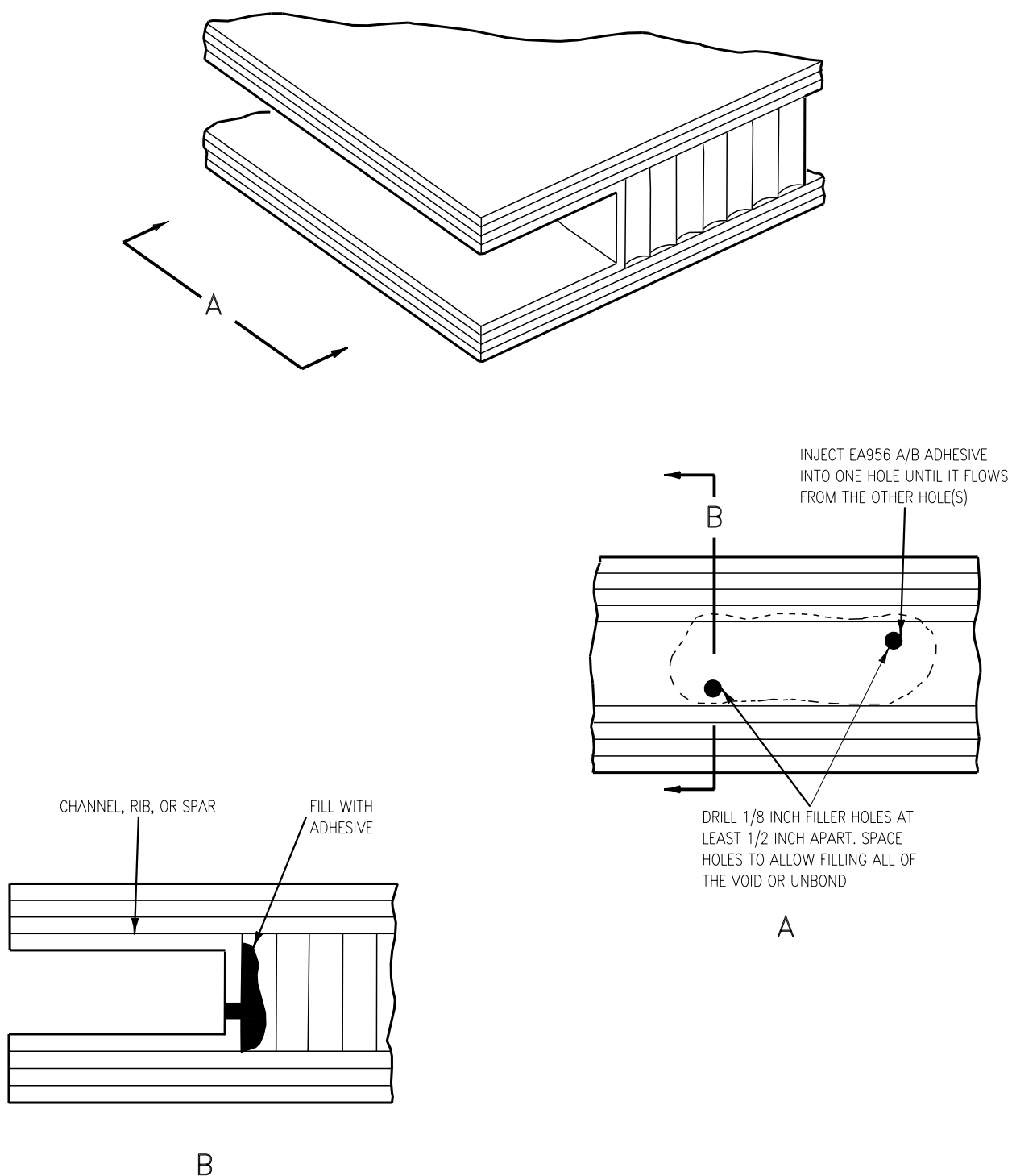


Figure 1. Class V Damage Repair



## INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS VI DAMAGE REPAIR

This WP supersedes WP044 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Nondestructive Inspection .....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core .....	WP008 01
Pulse Echo, Longitudinal Wave, Contact, Without Delay Line, For Composite Laminate Material .....	WP008 02

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

Support Equipment Required		Specification or Part Number	Nomenclature
Part Number or Type Designation	Nomenclature		
74D110172-1001	Tool Set - Structural Repair, Composite Materials	EA956 CCC-C-440 TYPE 1 CLASS 1 200SG40TR	Adhesive Cheesecloth
—	Cutting Tool, Controlled Depth	A-A-1047 GRIT 180-9X11, 240-9X11	Plastic Sheet Paper, Abrasive
—	Lay-Up Table	MIL-C-9084, TYPE 8, CLASS 2 MIL-C-9084, TYPE 3 CLASS 2	Cloth, Satin Cloth, Satin

**Materials Required (Continued)****Specification****or Part Number****Nomenclature**

020X413	Cleaning Compound
A-A-883, TYPE 1,	Tape, Pressure
1/4 IN,	Sensitive
1 IN	
TEMP-R-GLAS 6TB	Cloth, Teflon

**CAUTION**

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper.

b. Vacuum repair area using vacuum cleaner.

**CAUTION**

A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If plies of glass fabric cloth underneath are scratched or cut, strength of repair will be reduced.

c. Remove consecutive plies of damaged skin in a circular step pattern. Each step is 1/4 inch wide as shown in figure 1.

**CAUTION**

Care should be taken not to peel or rupture bond of skin plies beyond cutout perimeter.

d. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

e. Scrape each step and clean area by wiping with clean cheesecloth moistened with cleaning compound

f. Allow to air dry 15 minutes.

**CAUTION**

Failure to maintain correct weave direction will result in a repair that is extremely under strength.

**NOTE**

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

g. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

h. Cut replacement satin cloth pieces to size. The first ply may be cut in any weave direction. Remaining plies must be cut to match existing weave direction of plies they will overlap.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- i. Prepare adhesive (WP003 00).

## NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

- j. Place satin cloth pieces on clean lay up table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

## NOTE

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

- k. Lay up the first impregnated satin cloth piece in any weave direction.

- l. Lay up remaining impregnated satin cloth pieces with weave direction following existing plies they will overlap.

- m. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

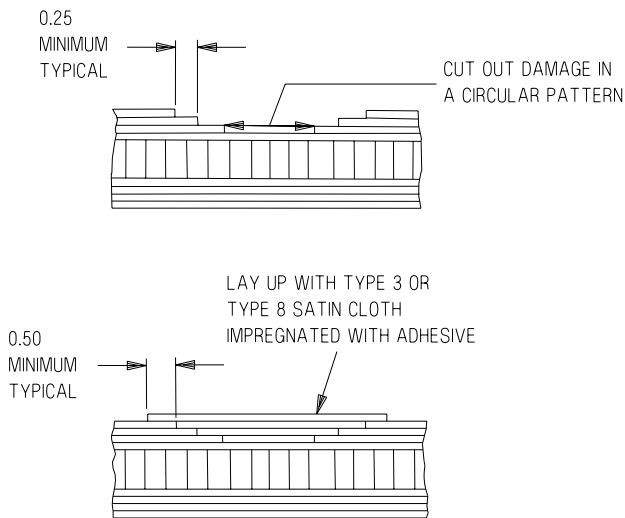
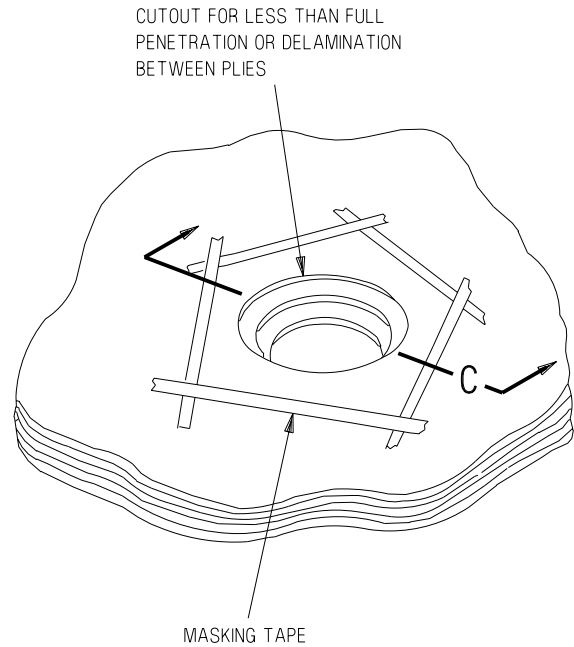
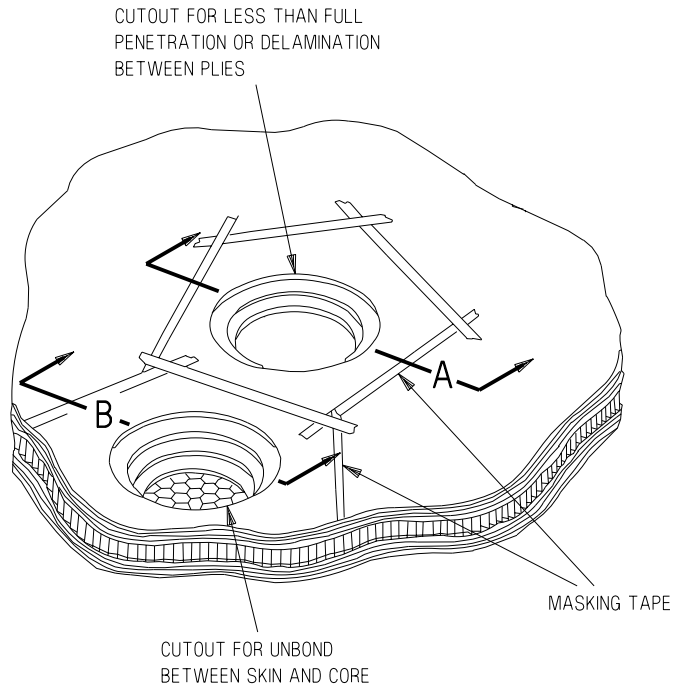
- n. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

## CAUTION

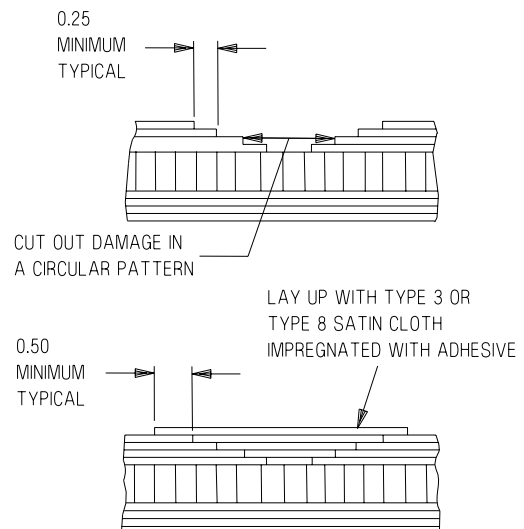
Use care not to sand into repair plies causing extra damage.

- o. Sand area lightly using 240 grit abrasive paper to remove surface roughness.

- p. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01 or WP008 02). If damaged area is not repaired, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

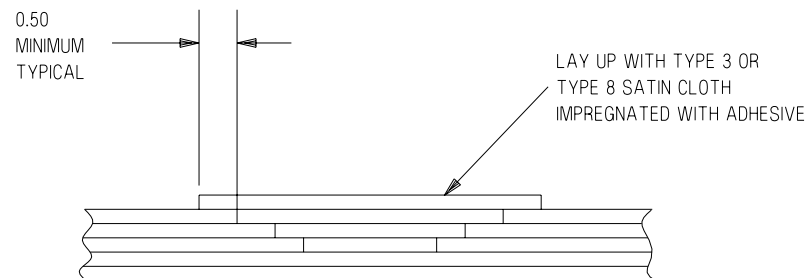
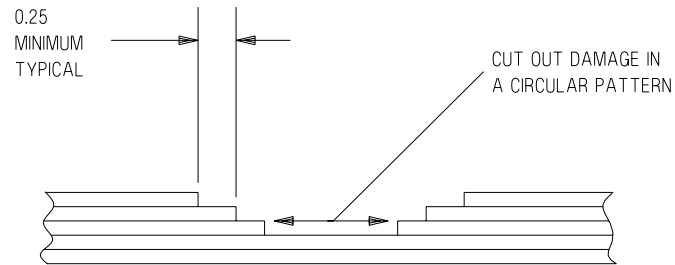


A



B

**Figure 1. Class VI Damage Repair (Sheet 1)**



C

**Figure 1. Class VI Damage Repair (Sheet 2)**





## INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS VII DAMAGE REPAIR

This WP supersedes WP045 00, dated 1 January 1995.

## Reference Material

Structure Repair, Typical Repair .....	A1-F18AC-SRM-250
Material Preparation .....	WP003 00
Curing of Repairs .....	WP004 00
Nondestructive Inspection .....	A1-F18AC-SRM-300
Pulse Echo, Longitudinal Wave, Contact, Without Delay Line, For Composite Laminate Material .....	WP008 02

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## Record of Applicable Technical Directives

None

1. **PROCEDURE.** See figure 1.

## Materials Required

## Support Equipment Required

## NOTE

Alternate item part numbers are shown indented.

Part Number or Type Designation	Nomenclature	Specification or Part Number	Nomenclature
74D110172-1001	Tool Set -		
	Structural Repair,	EA956	Adhesive
	Composite Materials	CCC-C-440 TYPE 1	Cheesecloth
—	Cutting Tool,	CLASS 1	
	Controlled Depth	200SG40TR	Plastic Sheet
—	Lay-Up Table	A-A-1047 GRIT	Paper, Abrasive
		180-9X11,	
		240-9X11	
		MIL-C-9084, TYPE 8,	Cloth, Satin
		CLASS 2	

**Materials Required (Continued)****NOTE**

■ Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

MIL-C-9084, TYPE 3,  
CLASS 2

Cloth, Satin

—  
1/8-Inch Thick, Size as  
Required to Cover  
Repair

Wood Plug  
Metal Backup Plates

Camie A1000  
S00311

Release Agent  
Release Agent

A-A-883, TYPE 1,  
1/4 IN,  
1 IN

Tape, Pressure  
Sensitive

■ 855-1.000 IN.

Tape, Pressure Sensi-  
tive

TEMP-R-GLAS 6TB  
020X413

Cloth, Teflon  
Cleaning Compound

**CAUTION**

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper.

b. Vacuum dust from repair area using vacuum cleaner.

**CAUTION**

A cutting tool with controlled cutting depth may be used to avoid possible damage to layers underneath. If layers of glass cloth underneath are scratched or cut, strength of repair will be reduced.

**NOTE**

Determine number of plies to maintain equal step pattern on each side of repair.

c. Cut out damaged skin to a circular pattern. See figure 1, step 1.

d. Remove consecutive plies of skin in a circular step pattern. Each step is 1/4-inch wide as shown in figure 1, step 2.

**CAUTION**

Care should be taken not to peel or rupture bonded skin plies beyond cutout perimeter.

e. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

f. Scrape each step and clean area by wiping with clean cheesecloth moistened with cleaning compound.

g. Allow to air dry 15 minutes.

## NOTE

A wood plug is used to support lay up from falling through cutout.

- h. Fabricate a wood plug to fit in cutout as shown in figure 1, step 3.

## WARNING

Camie A1000 release agent is a flammable liquid and vapor. May cause allergic skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Use only with adequate ventilation. Avoid breathing dust (vapor, mist, gas). Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

S00311 release agent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

- i. Cover wood plug with release agent. Position wood plug in repair facing layup.

- j. Center backing plate over plug. Secure in place with pressure sensitive tape.

## CAUTION

Failure to maintain correct weave direction will result in repair that is extremely under strength.

## NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

- k. Determine thickness of damaged part. Refer to applicable structure repair manual

A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

- l. Cut replacing satin cloth pieces to size. The first ply may be cut in any weave direction. Remaining plies must be cut to match existing plies they will overlap.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- m. Prepare adhesive (WP003 00).

## NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

- n. Place satin cloth pieces on clean layup table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

## NOTE

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

- o. Lay up first impregnated satin cloth piece in any weave direction. See figure 1, step 4.

- p. Lay up remaining impregnated satin cloth pieces with weave direction following existing plies they will overlap. See figure 1, step 4.

- q. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

- r. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

- s. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

- t. Remove backing plate and wood plug, from repair.



A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If plies underneath are scratched or cut, strength of repair will be reduced.

- u. Remove successive plies of skin in a circular step pattern on opposite side of repair area. Each step is 1/4-inch wide as shown in figure 1, step 5.



Care should be taken not to peel or rupture bond of skin plies beyond cutout perimeter.

- v. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.



Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

- w. Scrape each step and clean area by wiping with clean cheesecloth moistened with cleaning compound

- x. Allow to air dry 15 minutes.



Failure to maintain correct weave direction will result in a repair that is extremely under strength.

### NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

- y. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

- z. Cut replacing satin cloth pieces to precise size. The satin pieces must be cut to match existing weave direction of plies they will overlap.



Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

- aa. Prepare adhesive (WP003 00).

### NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

- ab. Place satin cloth pieces on clean layup table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

## NOTE

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

ac. Lay up impregnated satin cloth pieces with weave direction following existing plies they will overlap. See figure 1, step 6.

ad. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

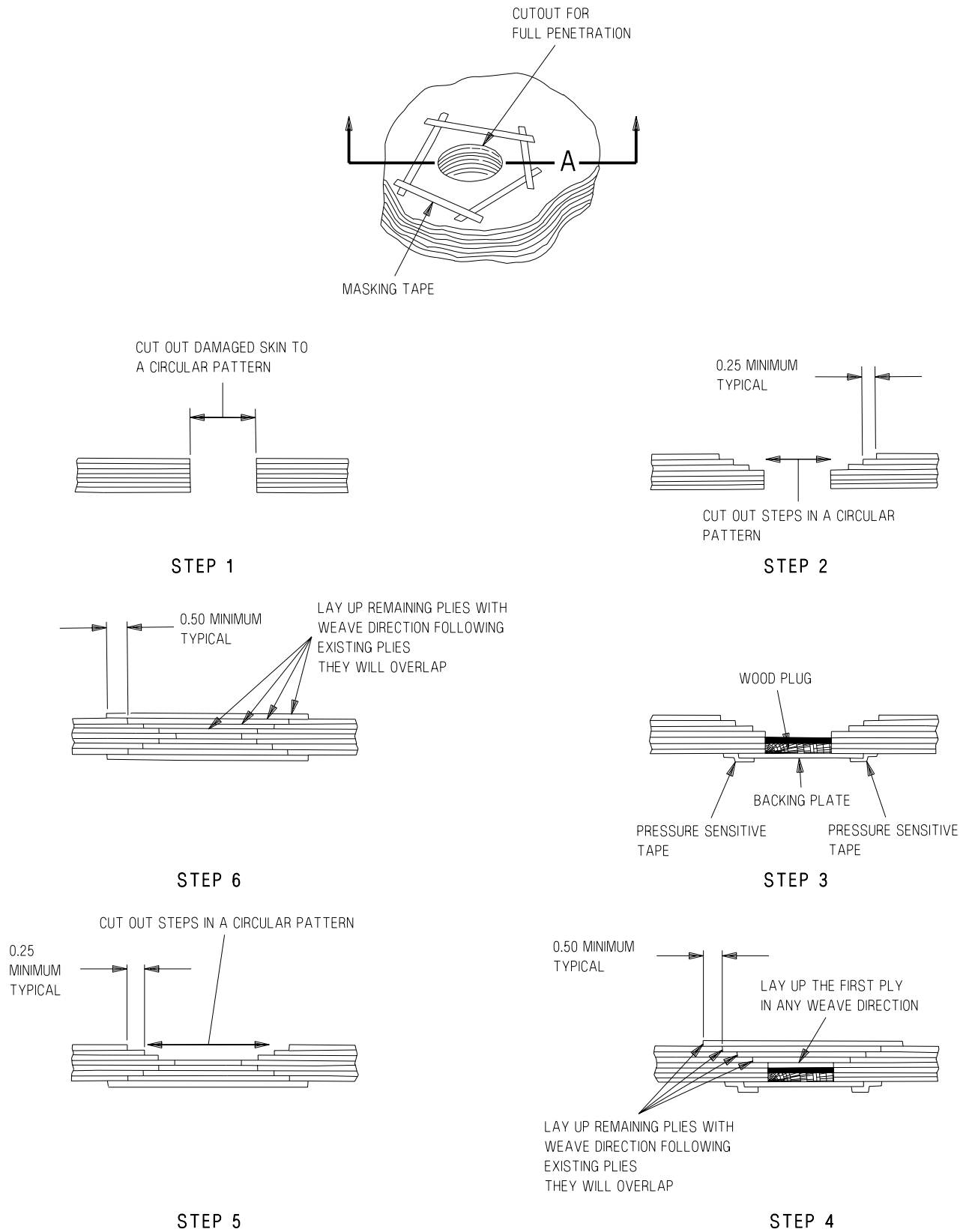
ae. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).



Use care not to sand into repair plies causing extra damage.

af. Sand area lightly using 240 grit abrasive paper to remove surface roughness.

ag. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 02). If damage is not repaired, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing the damaged part.



**Figure 1. Class VII Damage Repair**

## INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS VIII DAMAGE REPAIR

This WP supersedes WP046 00, dated 1 January 1995.

## Reference Material

Structural Repair, Typical Repair.....	A1-F18AC-SRM-250
Material Preparation.....	WP003 00
Curing of Repairs.....	WP004 00
Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core.....	WP008 01

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Full Penetration of One Skin With Core Damage .....	1

## Record of Applicable Technical Directives

None

**1. FULL PENETRATION OF ONE SKIN  
WITH CORE DAMAGE.** See figure 1, detail A.

**Support Equipment Required  
(Continued)**

Support Equipment Required		Part Number or Type Designation	Nomenclature
Part Number or Type Designation	Nomenclature	538A	Air Regulator Assembly, with Oil- Water Separator and Gage
74D110172-1001	Tool Set - Structural Repair, Composite Materials		
—	Cutting Tool, Controlled Depth		
—	Lay-Up Table		



**Materials Required****Specification  
or Part Number****Nomenclature**

EA9321 A/B	Adhesive
EA956	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
200SG40TR	Plastic Sheet
A-A-1047 GRIT 180-9X11 240-9X11	Paper, Abrasive
MIL-C-9084, TYPE 8, CLASS 2	Cloth, Satin
MIL-C-9084, TYPE 3, CLASS 2	Cloth, Satin
420	Sealant Gun Nozzle
TEMP-R-GLAS 6TB	Cloth, Teflon
A-A-883, TYPE 1, 1/4 IN, 1 IN	Tape, Pressure Sensitive
020X413	Cleaning Compound

**CAUTION**

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper.

b. Vacuum dust from repair area using vacuum cleaner.

**CAUTION**

A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If the plies of glass cloth underneath are scratched or cut, the strength of repair will be reduced.

c. Remove consecutive plies of damaged skin in a circular step pattern. Each step is 1/4-inch wide. See detail A, step 1.

**CAUTION**

Care should be taken not to peel or rupture the bond of skin plies beyond cutout perimeter.

d. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

e. Carefully cut out core that is exposed.

**CAUTION**

Pulling out core without twisting motion could cause delamination of skin to which core is bonded.

f. Remove core completely down to other skin. Leave a cylindrical void same diameter as last skin ply cutout.

**CAUTION**

Make sure when sanding not to damage skin plies.

g. Remove adhesive and core residue from inside of undamaged skin exposing inner surface.

h. Scrape each step and vacuum clean dust from repair area.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

i. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

j. Allow to air dry 15 minutes..

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

k. Prepare EA9321 A/B adhesive (WP003 00).

l. Fill sealant gun with EA9321 A/B adhesive.

m. Attach a regulated source of compressed air to sealant gun. Set air regulator for 8 psi.

n. Attach nozzle to sealant gun and insert into repair hole. Inject adhesive into repair area from the bottom up. Avoid trapping air in adhesive.

o. Move nozzle around repair area to make sure of complete filling.

p. Fill repair area level with top surface of first ply step. Add excess adhesive to allow for shrinkage. See detail A, step 2.

q. Cure EA9321 A/B adhesive (WP004 00).

r. After cure, sand repair area even with top surface of first ply step.

s. Vacuum clean dust from repair area.

t. Clean repair by wiping with clean cheesecloth moistened with cleaning compound.

u. Allow to air dry 15 minutes.

## CAUTION

Failure to maintain correct weave direction will result in a repair that is extremely under strength.

## NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

v. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

w. Cut replacing satin cloth pieces to size. The satin cloth pieces must be cut to match weave direction of plies they will overlap.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

x. Prepare EA956 adhesive (WP003 00).

## NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

y. Place satin cloth pieces on clean layup table and apply EA956 adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

z. Spread a thin layer of EA956 adhesive over exposed surface of cured EA9321 A/B adhesive.

**NOTE**

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

aa. Lay up impregnated satin cloth pieces with weave direction following plies they will overlap. See detail A, step 3.

ab. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

ac. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

**CAUTION**

Use care not to sand into repair plies causing extra damage.

ad. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

ae. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01). If damaged area is not repaired, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

**2. FULL PENETRATION OF BOTH SKINS.**

See figure 1, detail B.

**Support Equipment Required****Part Number or  
Type Designation****Nomenclature**

74D110172-1001

Tool Set -  
Structural Repair,  
Composite Materials  
Air Regulator  
Assembly, with Oil-  
Water Separator and  
Gage

538A

Cutting Tool,  
Controlled Depth  
Lay-Up Table

**Materials Required****NOTE**

Alternate item part numbers are shown indented.

**Specification  
or Part Number****Nomenclature**

EA956

Adhesive

EA9321 A/B

Adhesive

855-1.000 IN.

Pressure Sensitive Tape

CCC-C-440 TYPE 1

Cheesecloth

CLASS 1

200SG40TR

Plastic Sheet

A-A-1047 GRIT

Paper, Abrasive

180-9X11

240-9X11

420

Sealant Gun Nozzle

1/8-Inch Thick, Size as  
Required to Cover  
Repair

Metal Backup Plates

—

Wood Plug  
Cloth, Satin

MIL-C-9084, TYPE 8,  
CLASS 2

MIL-C-9084, TYPE 3,  
CLASS 2

Cloth, Satin

020X413

Cleaning Compound

A-A-883, TYPE 1,

Tape, Pressure  
Sensitive

1/4 IN,

1 IN

TEMP-R-GLAS 6TB

Cloth, Teflon

Camie A1000

Release Agent

S00311

Release Agent

**CAUTION**

Use care when removing surface finish  
not to damage base material of skin.

a. Mask off skin and remove finish 3 inches  
each direction from damage using 180 grit abrasive  
paper.

b. Vacuum dust from repair area using vacuum  
cleaner.

## CAUTION

A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If the plies of glass cloth underneath are scratched or cut, the strength of repair will be reduced.

c. Remove consecutive plies of damaged skin in a circular step pattern. Each step is 1/4-inch wide. See detail B, step 1.

## CAUTION

Care should be taken not to peel or rupture the bond of skin plies beyond cutout perimeter.

d. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

e. Carefully cut out core that is exposed.

f. Remove core completely down to other skin. Leave a cylindrical void same diameter as last skin ply cutout.

g. Cut out remaining damaged skin to same diameter as removed core.

h. Scrape each step and vacuum clean debris from repair area.

## WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

i. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

j. Allow to air dry 15 minutes.

## NOTE

A wood plug is used to support EA9321 A/B adhesive from falling through cutout.

k. Fabricate a wood plug to fit in cutout. See detail B, step 2.

## WARNING

Camie A1000 release agent is a flammable liquid and vapor. May cause allergic skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Use only with adequate ventilation. Avoid breathing dust (vapor, mist, gas). Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

S00311 release agent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

l. Cover plug with release agent. Position plug in repair with release agent facing layup.

m. Center backing plate over plug. Secure in place with pressure sensitive tape.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

n. Prepare EA9321 A/B adhesive (WP003 00).

o. Fill sealant gun with EA9321 A/B adhesive.

p. Attach a regulated source of compressed air to sealant gun. Set air regulator for 8 psi.

q. Attach nozzle to sealant gun and insert into repair hole. Inject adhesive into repair area from the bottom up. Avoid trapping air in adhesive.

r. Move nozzle around repair area to make sure of complete filling.

s. Fill repair area level with top surfaces of first ply steps. Add excess adhesive to allow for shrinkage. See detail B, step 2.

t. Cure EA9321 A/B adhesive (WP004 00).

u. After cure, sand repair areas even with top surfaces of first ply steps.

v. Vacuum clean dust from repair area.

w. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound

x. Allow to air dry 15 minutes.

### CAUTION

Failure to maintain correct weave direction will result in a repair that is extremely under strength.

### NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

y. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

z. Cut replacing satin cloth pieces to size. The satin cloth pieces must be cut to match weave direction of plies they will overlap.

### WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

aa. Prepare EA956 adhesive (WP003 00).

### NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

ab. Place satin cloth pieces on clean layup table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

ac. Spread thin layer of EA956 adhesive over exposed surface of cured EA9321 A/B adhesive.

### NOTE

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

ad. Lay up impregnated satin cloth pieces with weave direction following plies they will overlap. See detail B, step 3.

ae. Cover repair with plastic sheet. Workout air bubbles and excess adhesive.

af. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

### CAUTION

Use care not to sand into repair plies causing extra damage.

ag. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

ah. Remove backing plate and plug from repair.

**CAUTION**

A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If plies of glass cloth underneath are scratched or cut, the strength of repair will be reduced.

ai. Remove successive plies of skin in a circular step pattern on opposite side of repair area. Each step is 1/4-inch wide. See detail B, step 4.

**CAUTION**

Care should be taken not to peel or rupture bond of skin plies beyond cutout perimeter.

aj. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

ak. Scrape each step and vacuum clean.

al. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

am. Allow to air dry 15 minutes.

**CAUTION**

Failure to maintain correct weave direction will result in a repair that is extremely under strength.

**NOTE**

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

an. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

ao. Cut replacing satin cloth pieces to size. The satin cloth pieces must be cut to match weave direction of plies they will overlap.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

ap. Prepare EA956 adhesive (WP003 00).

**NOTE**

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

aq. Place satin cloth pieces on clean layup table and apply EA956 adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

ar. Spread a thin layer of EA956 adhesive over exposed surface of cured EA9321 A/B adhesive.

**NOTE**

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

as. Lay up impregnated satin cloth pieces with weave direction following plies they will overlap. See detail B, step 5.

at. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

au. Cure repair using heat/vacuum blanket or heat blanket with vacuum bag (WP004 00).

**CAUTION**

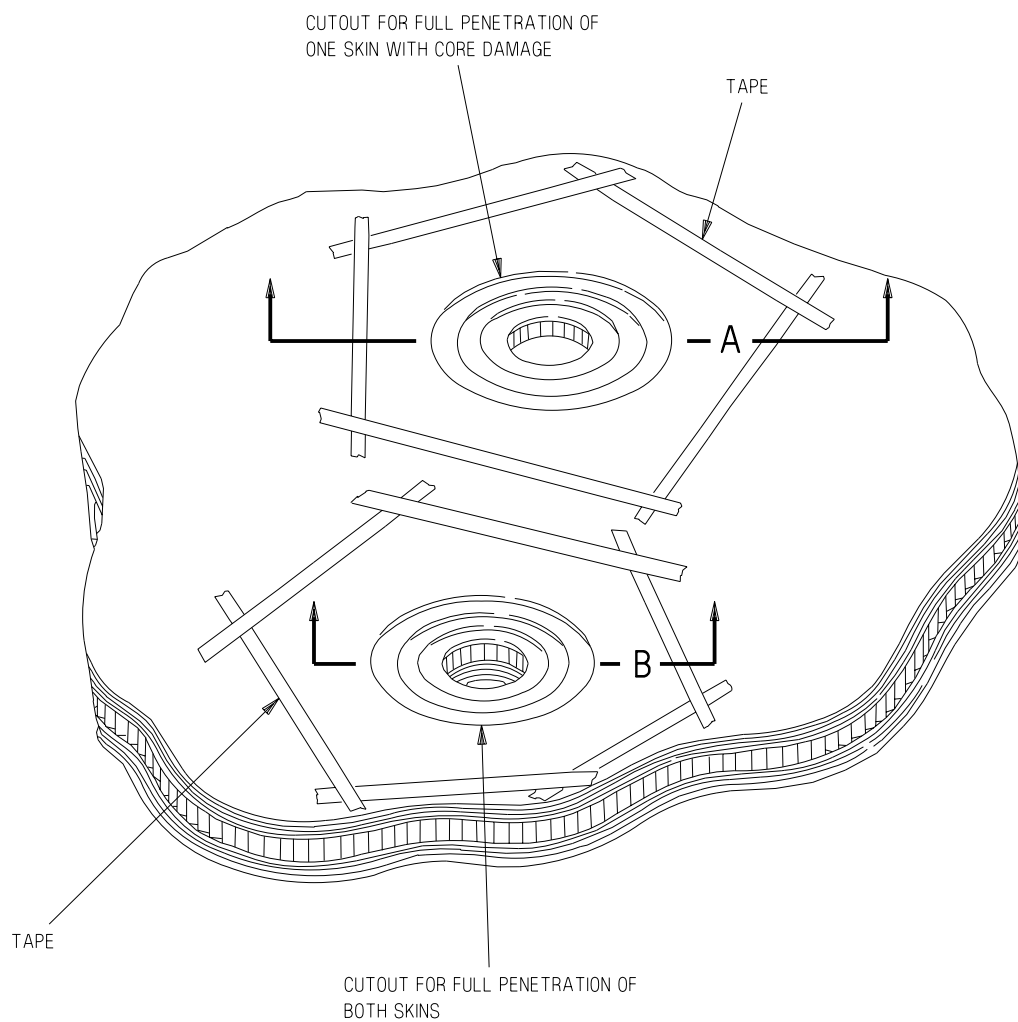
Use care not to sand into skin plies causing extra damage.

av. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

aw. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01). If damaged area is not repaired, reclassify the damage. Refer to applicable structure repair manual,

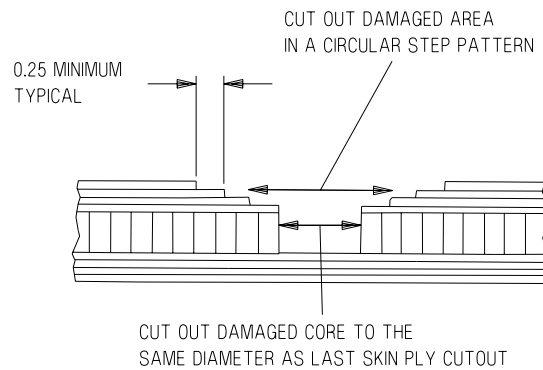
A1-F18AC-SRM-210 through -240 or  
A1-F18AE-SRM-600 through -750 containing  
damaged part.



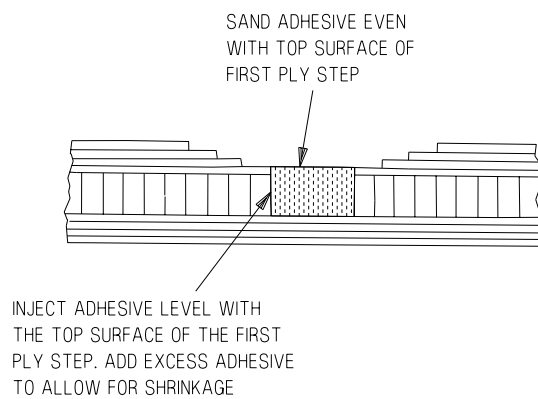


**Figure 1. Class VIII Damage Repair (Sheet 1)**

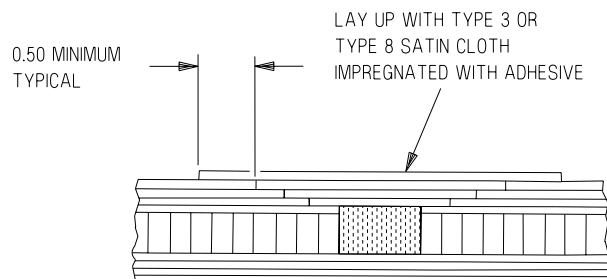




## STEP 1



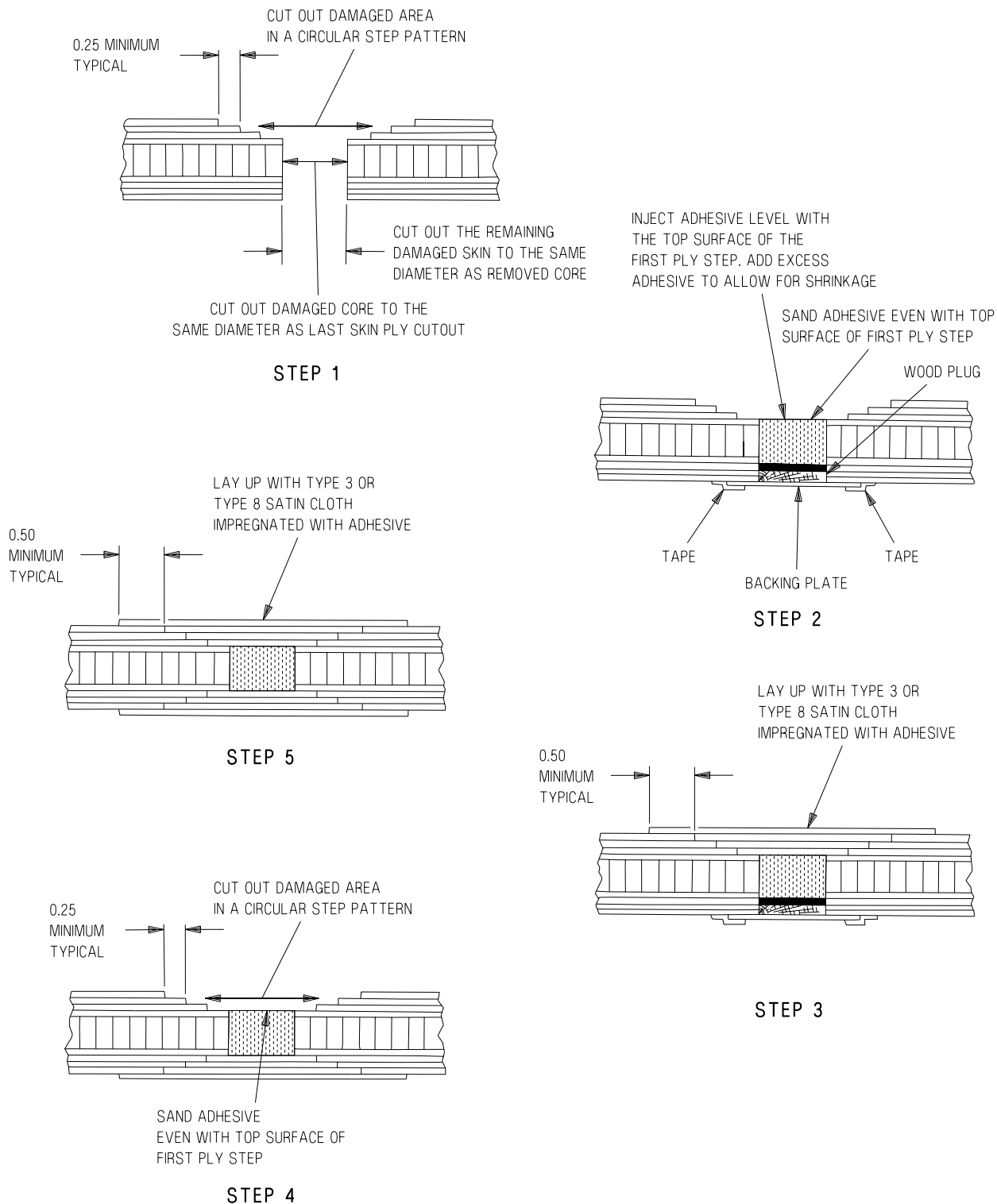
## STEP 2



## STEP 3

A

Figure 1. Class VIII Damage Repair (Sheet 2)



B

**Figure 1. Class VIII Damage Repair (Sheet 3)**



## INTERMEDIATE MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## FIBERGLASS OR ARAMID ASSEMBLY, CLASS IX DAMAGE REPAIR

## Reference Material

Structural Repair, Typical Repair.....	A1-F18AC-SRM-250
Material Preparation.....	WP003 00
Curing of Repairs.....	WP004 00
Nondestructive Inspection.....	A1-F18AC-SRM-300
Ultrasonic Through Transmission Contact Testing, Standardization, and Inspection Procedures for Composite Laminate Skins Bonded to Honeycomb Core.....	WP008 01

## Alphabetical Index

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Full Penetration of One Skin With Core Damage .....	1

## Record of Applicable Technical Directives

None

**1. FULL PENETRATION OF ONE SKIN  
WITH CORE DAMAGE.** See figure 1, detail A.

**Support Equipment Required  
(Continued)**

Support Equipment Required		Part Number or Type Designation	Nomenclature
Part Number or Type Designation	Nomenclature	538A	Air Regulator Assembly, with Oil- Water Separator and Gage
74D110172-1001	Tool Set - Structural Repair, Composite Materials		
—	Cutting Tool, Controlled Depth		
—	Lay-Up Table		

## Materials Required

## NOTE

Alternate item part numbers are shown indented.

Specification  
or Part Number

## Nomenclature

GG-D-223	Metal Spatula
EA956	Adhesive
EA9321 A/B	Adhesive
A-A-1047 GRIT	Paper, Abrasive
180-9X11	
240-9X11	
MIL-C-9084, TYPE 8, CLASS 2	Cloth, Satin
MIL-C-9084, TYPE 3, CLASS 2	Cloth, Satin
420	Sealant Gun Nozzle
200SG40TR	Plastic Sheet
020X413	Cleaning Compound
MIL-G-3866	Cotton Gloves
135001-1001, -1003, -1005, -1007, -1009 and -1011 1/8-Inch Thick Foil	Honeycomb Core Kit
or	or
74K000005	Aluminum Alloy Honeycomb Plug Repair, Kit
A-A-883, TYPE 1, 1/4 IN, 1 IN	Tape, Pressure Sensitive
TEMP-R-GLAS 6TB	Cloth, Teflon
855-1.000 IN.	Pressure Sensitive Tape
CCC-C-440 TYPE 1	Cheesecloth
CLASS 1	

## CAUTION

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper.

b. Vacuum dust from repair area using vacuum cleaner.

## CAUTION

A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If plies of glass fabric cloth underneath are scratched or cut, the strength of repair will be reduced.

c. Remove consecutive plies of damaged skin in a circular step pattern. Each step is 1/4-inch wide. See detail A, step 1.

## CAUTION

Care should be taken not to peel or rupture bond of skin plies beyond cutout perimeter.

d. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

e. Carefully cut out core that is exposed.

## CAUTION

Pulling out core without twisting motion could cause delamination of skin to which core is bonded.

f. Remove core completely down to undamaged skin. Leave a cylindrical void same diameter as last skin ply cutout.

## CAUTION

Use care not to sand into skin plies causing extra damage.

g. Remove adhesive and core residue from inside of undamaged skin.

h. Scrape each step and vacuum clean sanding dust from repair area.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

i. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

j. Allow to air dry 15 minutes.

**NOTE**

Wear clean cotton gloves when handling honeycomb core.

k. Get correct section of honeycomb core per table 1. Select required dash number of honeycomb

core to make repair to applicable damaged assembly identified in A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual.

**NOTE**

Make sure ribbon direction of core plug is the same as existing honeycomb core. For method of determining honeycomb core ribbon direction, refer to applicable A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual containing damaged assembly.

l. Cut honeycomb core plug to fit tightly inside cutout. Core plug should be even with or slightly higher than top surface of first ply step.

m. Clean core plug with cleaning compound and allow to air dry 15 minutes.

**Table 1.**

DASH NO.	SIZE		
	LENGTH	WIDTH	THICKNESS
-1001	9-INCH	9-INCH	2.0 INCH
-1003	9-INCH	9-INCH	4.0 INCH
-1005	9-INCH	9-INCH	6.0 INCH
-1007	12-INCH	12-INCH	2.0 INCH
-1009	12-INCH	12-INCH	4.0 INCH
-1011	12-INCH	12-INCH	6.0 INCH

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

n. Prepare EA9321 A/B adhesive (WP003 00).

o. Using sealing gun and nozzle, inject a layer of adhesive over area of far side of lower skin. See detail A, step 2.

p. Using a spatula, apply a layer of adhesive all around core plug and existing core that will mate with core plug.

q. Carefully press core plug into cutout. Wipe clean any excess adhesive. Visually inspect to verify if repair area is filled, if not, use sealing gun and nozzle to inject more adhesive into voids.

r. Cure EA9321 A/B adhesive (WP004 00).

s. Lightly sand core plug flush with top surface of first ply step.

t. Vacuum clean dust from repair area.

u. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

v. Allow to air dry 15 minutes.

## CAUTION

Failure to maintain correct weave direction will result in repair that is extremely under strength.

## NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

w. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

x. Cut replacing satin cloth pieces to size. Satin cloth pieces must be cut to match weave direction of plies they will overlap.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

y. Prepare EA956 adhesive (WP003 00).

## NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

z. Place satin cloth pieces on clean layup table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

aa. Spread thin layer of EA956 adhesive over exposed surface of honeycomb core plug.

**NOTE**

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

ab. Lay up impregnated satin cloth pieces with weave direction following plies they will overlap. See detail A, step 3.

ac. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

ad. Cure repair using heat cure method (WP004 00).



Be careful not to sand into repair plies causing extra damage.

ae. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

af. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01). If damaged area is not repaired, reclassify the damage. Refer to applicable structure repair manual, A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

## 2. FULL PENETRATION OF BOTH SKINS.

See figure 1, detail B.

### Support Equipment Required

Part Number or Type Designation	Nomenclature
74D110172-1001	Tool Set - Structural Repair, Composite Materials
—	Cutting Tool, Controlled Depth
—	Lay-Up Table
538A	Air Regulator Assembly, with Oil- Water Separator and Gage

### Materials Required

**NOTE**

Alternate item part numbers are shown indented.

#### Specification or Part Number

#### Nomenclature

EA956	Adhesive
EA9321 A/B	Adhesive
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
200SG40TR	Plastic Sheet
A-A-1047 GRIT 180-9X11 240-9X11	Paper, Abrasive
MIL-C-9084, TYPE 8, CLASS 2	Cloth, Satin
MIL-C-9084, TYPE 3, CLASS 2	Cloth, Satin
1/8-Inch Thick, Size as Required to Cover Repair	Metal Backup Plates
420	Sealant Gun Nozzle
020X413	Cleaning Compound
Camie A1000	Release Agent
S00311	Release Agent
MIL-G-3866	Cotton Gloves
135001-1001, -1003, -1005, -1007, -1009 and -1001 1/8-Inch Thick Foil	Honeycomb Core Kit
A-A-883, TYPE 1, 1/4 IN, 1 IN	Tape, Pressure Sensitive
855-1.000 IN. TEMP-R-GLAS 6TB	Pressure Sensitive Tape
GG-D-223	Cloth, Teflon Metal Spatula



**CAUTION**

Use care when removing surface finish not to damage base material of skin.

a. Mask off skin and remove finish 3 inches each direction from damage using 180 grit abrasive paper.

b. Vacuum dust from repair area using vacuum cleaner.

**CAUTION**

A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If plies of glass fabric cloth underneath are scratched or cut, the strength of repair will be reduced.

c. Remove successive plies of damaged skin in a circular step pattern. Each step is 1/4-inch wide. See detail B, step 1.

**CAUTION**

Care should be taken not to peel or rupture bond of skin plies beyond cutout perimeter.

d. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

e. Carefully cut out core that is exposed.

f. Remove core completely down to inner surface of other damaged skin. Leave a cylindrical void same diameter as last skin ply cutout.

g. Cut out remaining damaged skin to same diameter as removed core.

h. Scrape each step and vacuum clean debris from repair area.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

i. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

j. Allow to air dry 15 minutes.

**NOTE**

A wood plug is used to support honeycomb core plug during curing.

k. Fabricate a wood plug to fit in diameter of cutout. See detail B, step 2.

**WARNING**

Camie A1000 release agent is a flammable liquid and vapor. May cause allergic skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Use only with adequate ventilation. Avoid breathing dust (vapor, mist, gas). Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

S00311 release agent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

l. Cover wood plug with release agent. Position wood plug in repair cutout with release agent facing layup.

m. Center backing plate over plug. Secure in place with pressure sensitive tape.

**NOTE**

Wear clean cotton gloves when handling honeycomb core.

core to make repair to applicable damaged assembly identified in A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual.

n. Get correct section of honeycomb core per table 1. Select required dash number of honeycomb

**Table 2.**

DASH NO.	SIZE		
	LENGTH	WIDTH	THICKNESS
-1001	9-INCH	9-INCH	2.0 INCH
-1003	9-INCH	9-INCH	4.0 INCH
-1005	9-INCH	9-INCH	6.0 INCH
-1007	12-INCH	12-INCH	2.0 INCH
-1009	12-INCH	12-INCH	4.0 INCH
-1011	12-INCH	12-INCH	6.0 INCH

**NOTE**

Make sure ribbon direction of core plug is same direction as existing honeycomb core. For method of determining honeycomb core ribbon direction refer to applicable A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 structure repair manual containing damaged assembly.

o. Cut honeycomb core plug to fit tightly inside cutout. Core plug should be even with or slightly higher than top surfaces of first ply steps.

p. Clean core plug with cleaning compound and allow to air dry 15 minutes.

**WARNING**

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

q. Prepare EA9321 A/B adhesive (WP003 00).

r. Using spatula, apply a layer of adhesive all around core plug and existing core that will mate with core plug.

s. Carefully press core plug into cutout. Wipe clean any excess adhesive. Visually inspect to verify if repair area is filled, if not, use sealing gun and nozzle to inject more adhesive into voids.

t. Cure EA9321 A/B adhesive (WP004 00).

u. Lightly sand repair core plug flush with top surface of first ply step.

v. Vacuum clean dust from repair area.

w. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

x. Allow to air dry 15 minutes.



Failure to maintain correct weave direction will result in a repair that is extremely under strength.

### NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

y. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

z. Cut replacing satin cloth pieces to size. Satin cloth pieces must be cut to match weave direction of plies they will overlap.

### WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin and eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

aa. Prepare EA956 adhesive (WP003 00).

### NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

ab. Place satin cloth pieces on clean layup table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

ac. Spread thin layer of EA956 adhesive over exposed surface of honeycomb core plug.

### NOTE

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

ad. Lay up impregnated satin cloth pieces with weave direction following plies they will overlap. See detail B, step 3.

ae. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

af. Cure repair using heat cure method (WP004 00).



Use care not to sand into repair plies causing extra damage.

ag. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

ah. Remove backing plate, plastic sheet and wood plug from repair.



A cutting tool with a controlled cutting depth may be used to avoid possible damage to plies underneath. If plies of glass fabric cloth underneath are scratched or cut, the strength of repair will be reduced.

ai. Remove consecutive plies of skin in a circular step pattern on opposite side of repair area. Each step is 1/4-inch wide. See detail B, step 4.

## CAUTION

Care should be taken not to peel or rupture bond of skin plies beyond cutout perimeter.

aj. Remove section of each ply by peeling from center and working carefully to desired perimeter of cutout.

ak. Lightly sand repair core plug flush with top surface of first ply step. See detail B, step 4.

al. Scrap each step and vacuum clean with vacuum cleaner.

am. Clean repair area by wiping with clean cheesecloth moistened with cleaning compound.

an. Allow to air dry 15 minutes.

## CAUTION

Failure to maintain correct weave direction will result in a repair that is extremely under strength.

## NOTE

Laminated structure assemblies are made up of approximately 5 and 10 mil ply thickness. Assemblies with 10 mil plies are repaired with MIL-C-9084, type 8 satin cloth, and assemblies with 5 mil plies are repaired with MIL-C-9084, type 3 satin cloth.

ao. Determine thickness of damaged part. Refer to applicable structure repair manual A1-F18AC-SRM-210 through -240 or A1-F18AE-SRM-600 through -750 containing damaged part.

ap. Cut replacing satin cloth pieces to size. Satin cloth pieces must be cut to match weave direction of plies they will overlap.

## WARNING

Adhesive is toxic. Avoid breathing of vapors. Avoid contact with skin or eyes. Wear gloves and goggles while handling. If eye contact is made, wash immediately with large amount of water. If skin contact is made, wash immediately with soap and water.

aq. Prepare EA956 adhesive (WP003 00).

## NOTE

Cover layup table with teflon cloth to prevent impregnated satin cloth from sticking to layup table.

ar. Place satin cloth pieces on clean layup table and apply adhesive. Thoroughly impregnate satin cloth pieces using squeegee.

as. Spread thin layer of EA956 adhesive over exposed surface of honeycomb core plug.

## NOTE

Make sure satin cloth pieces butt up to existing plies but not overlapping them. Satin cloth pieces must be kept to correct matching thickness.

at. Lay up impregnated satin cloth pieces with weave direction following plies they will overlap. See detail B, step 5.

au. Cover repair with plastic sheet. Work out air bubbles and excess adhesive.

av. Cure repair using heat cure method (WP004 00).

## CAUTION

Use care not to sand into repair plies causing extra damage.

aw. Sand repair area lightly using 240 grit abrasive paper to remove surface roughness.

ax. Do NDI to make sure damaged area is repaired (A1-F18AC-SRM-300, WP008 01). If

# A1-F18AC-SRM-250

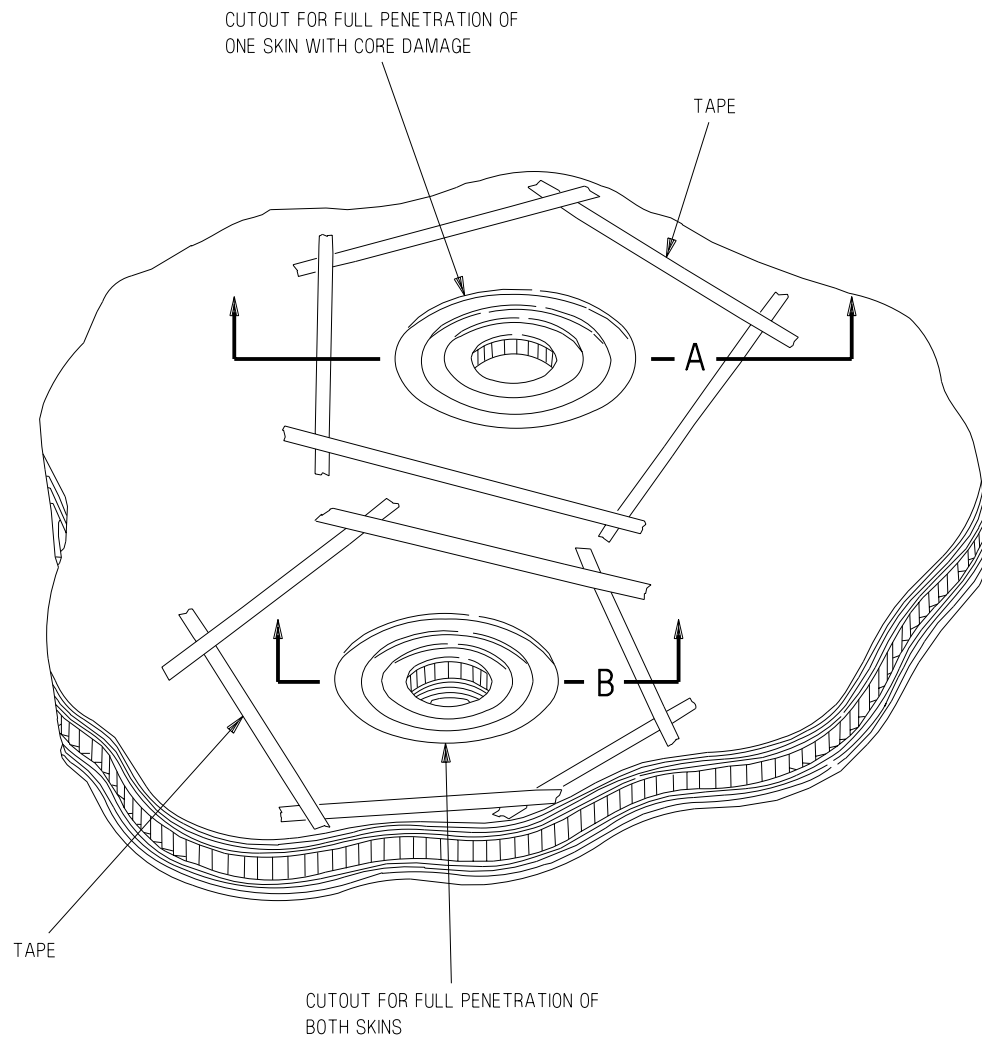
**Change 1**

**047 00**

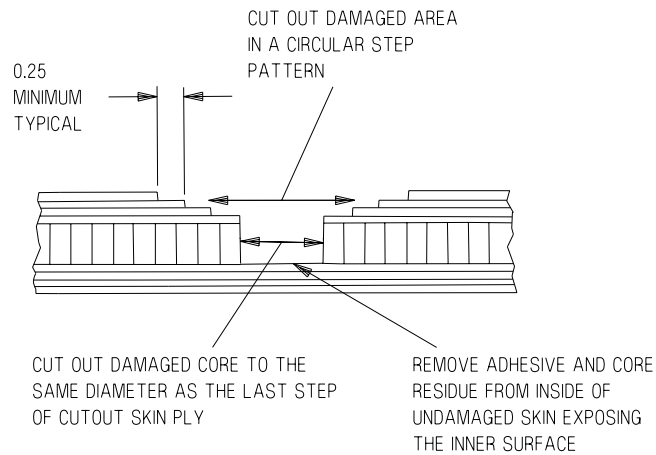
**Page 10**

damaged area is not repaired, reclassify the damage.  
Refer to applicable structure repair manual,  
A1-F18AC-SRM-210 through -240 or

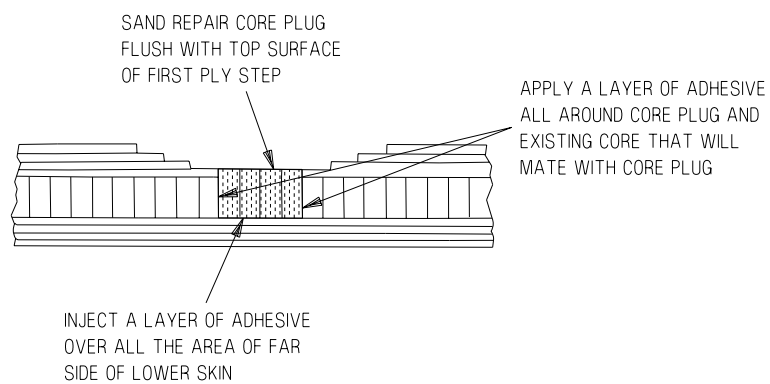
A1-F18AE-SRM-600 through -750 containing  
damaged part.



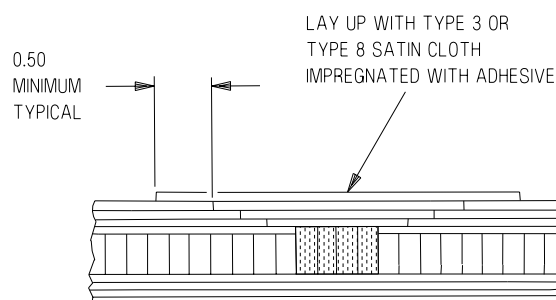
**Figure 1. Class IX Damage Repair (Sheet 1)**



## STEP 1



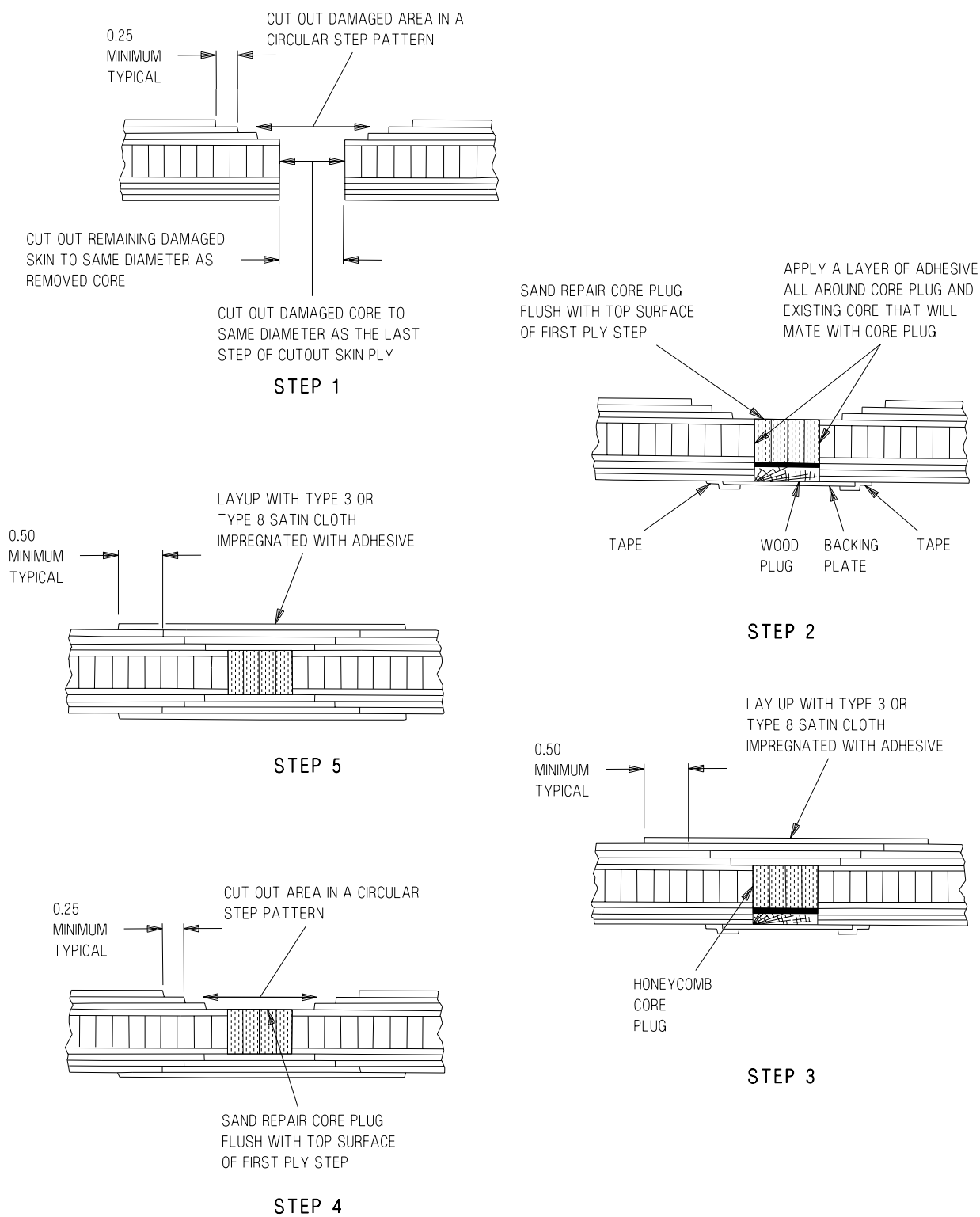
## STEP 2



## STEP 3

A

**Figure 1. Class IX Damage Repair (Sheet 2)**



B

**Figure 1. Class IX Damage Repair (Sheet 3)**





## ORGANIZATIONAL MAINTENANCE

## STRUCTURAL REPAIR

## TYPICAL REPAIR

## USE OF EQUIPMENT HISTORY RECORD (EHR) CARD

## Reference Material

None

## Alphabetical Index

Subject	Page No.
Description .....	1
Recording Previous Repairs .....	1

## Record of Applicable Technical Directives

None

## Support Equipment Required

None

## Materials Required

None

## 3. RECORDING PREVIOUS REPAIRS.

## NOTE

Before making additional repairs make sure any previous repairs are recorded. Record previous repairs on (EHR) card per steps below.

## 1. DESCRIPTION.

2. This work package contains methods for tracking current and previous repair weights on control surfaces of A1-F18AC-SRM-210 and -240 or A1-F18AE-SRM-600 and -750 structure repair manual. The Equipment History Record (EHR) card is a maintenance record to document date of repair, activity/custodian, repair zone, class/type of damage, flight hours, and recording weight of repair. Figure 1 shows method for maintaining (EHR) card.

a. Enter current day, month, and year within date column.

b. Enter words "Previous Repairs" within activity column.

c. Enter repair zone, current flight hours, class of damage, and conservative estimate of net repair weight within remarks, and major parts replaced column.

d. Person having logbook/record signature authority will sign within signature column.

EQUIPMENT HISTORY RECORD (EHR) CARD									
SECTION I - IDENTIFICATION DATA									
A. NOMENCLATURE			B. WORK UNIT CODE		C. FSCM		D. REPLACEMENT INTERVAL		E. MAINTENANCE DUE
F. PART NUMBER		G. SERIAL NUMBER			H. CFA		I. REFERENCE		
SECTION II - INSTALLATION DATA									
A. DATE	B. BUNO/SERNO INSTALLED ON			C. TOTAL AIRCRAFT/EQUIPMENT HOURS OR COUNTS				D. TOTAL HOURS OR COUNTS ON ITEM	
								MONTHS	
SECTION III - REMOVAL DATA									
A. DATE	B. TOTAL AIRCRAFT/EQUIPMENT HOURS OR COUNTS				C. TOTAL HOURS OR COUNTS ON ITEM			D. REASON FOR REMOVAL AND JOB CONTROL NUMBER	
SECTION IV - MAINTENANCE RECORD									
A. DATE	B. ACTIVITY			C. REMARKS AND MAJOR PARTS REPLACED				D. SIGNATURE	
1	2			3				4	

## LEGEND

- 1 ENTER THE DAY, MONTH, AND YEAR MAINTENANCE IS PERFORMED. EXAMPLE: 15 JULY 86.
- 2 ACTIVITY/CUSTODIAN; ENTER THE SHORT TITLE OF ACTIVITY/CUSTODIAN PERFORMING THE MAINTENANCE EXAMPLE: NARF JAX.

- 3 REMARKS AND MAJOR PARTS REPLACED; EXAMPLE: REPAIR ZONE, FLIGHT HOURS, CLASS OF DAMAGE, AND WEIGHT OF REPAIRS.
- 4 SIGNATURE; PERSON HAVING LOGBOOK/RECORDS SIGNATURE AUTHORITY WILL SIGN THIS BLOCK EXAMPLE: JOHN B. WRIGHT.

Figure 1. Equipment History Record (EHR) Card

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**ORGANIZATIONAL AND DEPOT MAINTENANCE**
**STRUCTURAL REPAIR****TYPICAL REPAIR****TIN/ZINC COATING**


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**Reference Material**

Typical Repair.....	A1-F18AC-SRM-250
Elastomeric Coating.....	WP 050 00
Aircraft Corrosion Control.....	A1-F18AC-SRM-500
Removal and Cleanup of Corrosion from Structure at Doors 3, 6, 10, 13, and 14.....	WP 005 03
Priming Procedures .....	WP 011 00
Finish System .....	WP 012 00
Radome Finish System and Markings.....	WP 015 00

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Damage Evaluation .....	2
Negligible Damage .....	2
Repairable Damage.....	2
Description .....	1
Location of Conductive Coating .....	2
Repairs.....	2

**Record of Applicable Technical Directives**

None

**1. DESCRIPTION.**

2. Conductive coating applied to the external (outer mold line) surfaces serve two purposes. On 161353 THRU 163782, external conductive coatings are applied only for EMI (electro magnetic interference) shielding. On 163985 AND UP, external conductive coatings are applied for EMI shielding and for radar cross section (RCS) reduction. Originally, all conductive coatings consisted of arc sprayed tin/zinc coating, with limited use of E-Kote conductive paint. Conductive paint, FP-70 (Caap Co), was introduced to

supersede and remove the requirement for tin/zinc arc spray on external surfaces. E-Kote had been the external mold line conductive coating repair material, but is no longer available. FP-70 is now the only suitable material for repair and production outer mold line conductive coatings.

3. Tin/zinc metal spray is still used for EMI finger contact areas on access panels 3, 6, 10 L/R, 13 L/R,

and 14 L/R. Repair of these areas still requires tin/zinc metal spray (A1-F18AC-SRM-500, WP 005 03). Recoating of tin/zinc using electric arc spray system is depot maintenance.

4. **LOCATION OF TIN/ZINC COATING.** See figure 1.

5. Tin/zinc arc spray coating and conductive paint was applied to mold line surfaces and countersinks, unless specified differently in figure.

6. **DAMAGE EVALUATION.** See figure 2.

7. Damage is classified as negligible and repairable. Damage not listed or exceeding limits below requires depot engineering disposition.

8. **NEGLIGIBLE DAMAGE.** Negligible damage is damage that may be allowed to exist as is. Type and limits are cuts, pits, scratches, erosion, or abrasions that extend into topcoat but does not penetrate conductive coating (tin/zinc or conductive paint). If damage also effects elastomeric coatings (MMS443 radar absorbent material), evaluate and repair per WP 050 00.

9. **REPAIRABLE DAMAGE.** Repairable damage is damage that can be permanently repaired with no adverse affect on aircraft. Repair of class I and II damages is organizational maintenance. There are no surface area limitations to conductive coating damage, and only depth determines if damage is class I or II. If damage also effects elastomeric coatings (MMS443 radar absorbent material), evaluate and repair per WP 050 00.

10. **Class I Damage.** This class of damage applies to damage that may extend through topcoat (and elastomeric coating if applicable) and in conductive coating (tin/zinc conductive paint). For repair of damage, do Class I Repair, this WP.

11. **Class II Damage.** This class of damage applies to damage that may extend through conductive coating (tin/zinc or conductive paint) and basecoat (primer) providing no damage exists to underlying structure. Damage may apply to conductive coating (tin/zinc or conductive paint) in countersinks. This class of damage includes conductive coatings that have disbanded from the substrate. For repair of damage, do Class II Repair, this WP.

## 12. Damage to Conductive coating (Tin/Zinc or Conductive Paint) and Underlying Structure.

a. Remove conductive coating (tin/zinc conductive paint) as required using 180 grit abrasive paper.

b. Evaluate and repair structural damage identified in A1-F18AC-SRM-210 through -240 or, A1-F18AE-SRM-600 through -750 structure repair manual.

c. Reclassify damage to conductive coating. Do damage evaluation, this WP.

13. **REPAIRS.** See figure 3.

## Support Equipment Required

Part Number or Type Designation	Nomenclature
—	Heat Lamp

## Materials Required

Specification or Part Number	Nomenclature
TT-I-735 GRADE A D 1153	Isopropyl Alcohol Methyl Isobutyl Ketone Analyzed Regent
CCCC440TY1CL1	Cloth, Cheesecloth
ANSI B74.18 GRIT 180 SILICON CBD	Paper, Abrasive
ANSI B74.18 GRIT 240 SILICON CBD	Paper, Abrasive
UU-P-268RY1GRADEA	Kraft Paper
FP-70	Polyurethane Coating
H-B-695 TYPE1	Brush, Paint
GRADEA SIZE 1.500	
#79 Foam Pro or equiv.	Foam Roller, Paint, 1.00 Wide
—	Tray, Paint, 4.00 Wide

14. **Class I Repair.** See figure 3. This repair applies to damage that extends through topcoat and (and elastomeric coating if applicable) and partly through conductive coating (tin/zinc or conductive paint). The damage may be localized or extend over the whole surface area of a component, as long as it meets the class I damage criteria.

a. Verify that damage qualifies for Class I repair. If applicable, evaluate and repair esastomeric coatings (MMS443 radar absorbent material) per criteria and procedures in WP 050 00.

## WARNING

Methyl Isobutyl ketone and isopropyl alcohol are toxic to skin, eyes, and respiratory tract. Skin and eye protection required. Avoid repeated or prolonged contact Good general ventilation is normally enough.

b. Lightly scuff sand, by hand, the damaged area with 180 grit of finer abrasive paper.

c. Clean damaged area with cheesecloth dampened with isopropyl alcohol or use methyl isobutyl ketone if area is contaminated with heavy grease and dirt.

d. Wipe surface dry with clean, dry cheesecloth before solvent evaporates.

e. Prepare suitable amount of polyurethane topcoat coating conforming to MIL-P-85285, TYPE 1. Do preparation and mixing instructions (A1-F18AC-SRM-500, WP012 00).

f. Apply topcoat to damaged area with small brush (A1-F18AC-SRM-500, WP 012 00).

g. Allow topcoat to air dry 1 hour, then sand to smooth contour with 240 grit or finer abrasive mat.

**15. Class II Repair.** See figure 3. This repair applies to conductive coating (tin/zinc or conductive paint) that has disbanded from the substrate or to damage that may extend though conductive coating (tin/zinc or conductive paint) and basecoat (primer), including countersinks. The damage may be localized or extend over the whole surface area of a component, as long as it meets the class II damage criteria.

a. Remove any coatings that are peeling or have bond integrity in question to the substrate with a non-metallic scraper (plastic, fiberglass, or micarta).

b. Lightly scuff sand, by hand, the damaged area with 180 grit or finer abrasive paper.

## WARNING

Methyl Isobutyl ketone and isopropyl alcohol are toxic to skin, eyes, and respiratory tract. Skin and eye protection required. Avoid repeated or prolonged contact Good general ventilation is normally enough.

c. Clean damaged area with clean cheesecloth dampened with isopropyl alcohol or methyl isobutyl ketone if area is contaminated with heavy petroleum products and dirt.

d. Wipe surface dry with clean, dry cheesecloth before solvent evaporates.

## CAUTION

Do not apply conductive paint to parts that require electromagnetic transmission, for example radomes and antennas.

Do not coat aluminum structure of doors with conductive paint. Conductive paint is not required on these areas and can result in gross corrosion.

e. Mask area next to repair zone.

## WARNING

Epoxy primer and polyurethane conductive coating are flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

f. Apply epoxy primer, MIL-P-85582, Type II, to substrate in repair area (A1-F18AC-SRM-500, WP 011 00). Allow primer to dry for 1 hour, then lightly scuff sand with 180 grit abrasive mat. If conductive paint will not be applied for 24 hours, reapply a tie coat of epoxy primer and scuff sand before continuing with application.

g. Mix polyurethane conductive coating per mixing instruction on container. Do not mix kits in

part, and do not add solvents to thin conductive paint.



Conductive particles contained in conductive paint tend to quickly settle to bottom of paint tray. Do not fill tray too deeply with conductive paint to make sure the brush or roller picks up particles. Also, thoroughly stir conductive paint with the brush during application.

h. Apply conductive paint to repair area, using figure 1 as guidance. If repair area is less than six square inches, apply conductive paint to damaged area with brush. If repair area is greater than 6 square inches, apply conductive paint to repair area with roller. Use a minimum of three cross coats (opposed 90 degree) allotting 10 to 15 minutes between cross coats. Continuously stir the paint to be sure of even distribution of conductive filler. Apply each stroke 90 degrees out from the previous stroke for brush and roller application.

i. Allow conductive paint to air dry for 20 minutes. Cure for 1 hour at 190 degrees Fahrenheit using heat lamp.

j. Lightly scuff sand surface of conductive paint with 240 grit sand paper to remove imperfections,

for example runs, sags, drips, and inclusions. Remove sanding residue using clean dry cheesecloth. Final wipe with clean cheese cloth wetted with isopropyl alcohol.

k. Restore elastomeric coatings (MMS443 radar absorbent material) as required, per WP 050 00.

l. Prepare suitable amount of polyurethane topcoat coating, conforming to MIL-P-85285 TYPE 1. Do preparation and mixing instructions (A1-F18AC-SRM-500, WP 012 00).

m. Apply topcoat over cured conductive paint (or cured elastomeric coating MMS443 radar absorbent material as applicable) in the repair area (A1-F18AC-SRM-500, WP 012 00).

n. Allow finish system to air cure 24 hours.

## 16. ARC SPRAY COATING OF TIN/ZINC (DEPOT MAINTENANCE).

17. Arc spray of tin/zinc coating is no longer required on outer mold line surfaces. The only areas that still require arc spray are EMI finger contact areas around doors 3, 6, 10 L/R, 13 L/R, and 14 L/R. For tin/zinc arc spray procedures and application in these areas (A1-F18AC-SRM-500, WP 005 03).

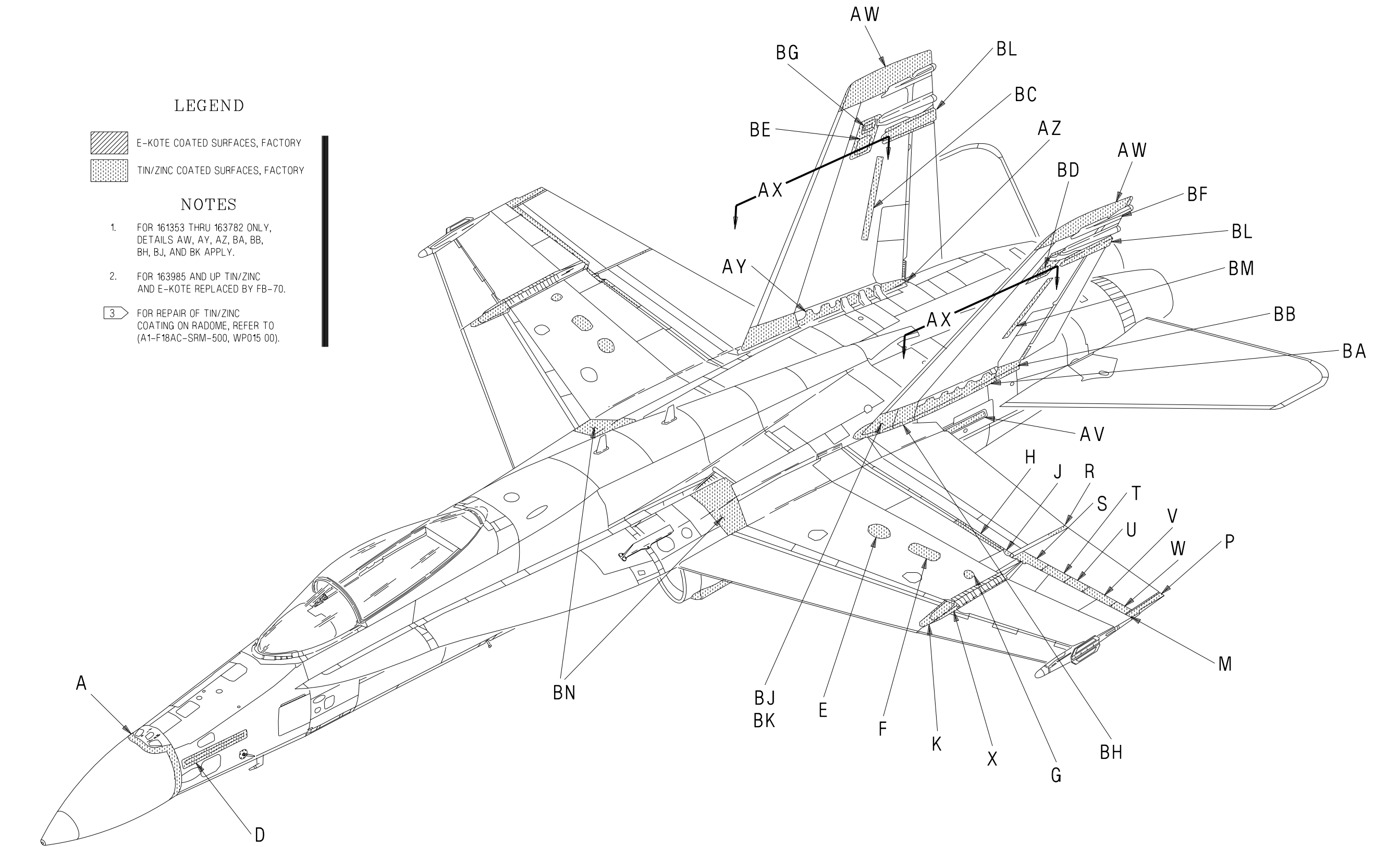


Figure 1.

Figure 1. Location of Conductive Coating (Sheet 1)



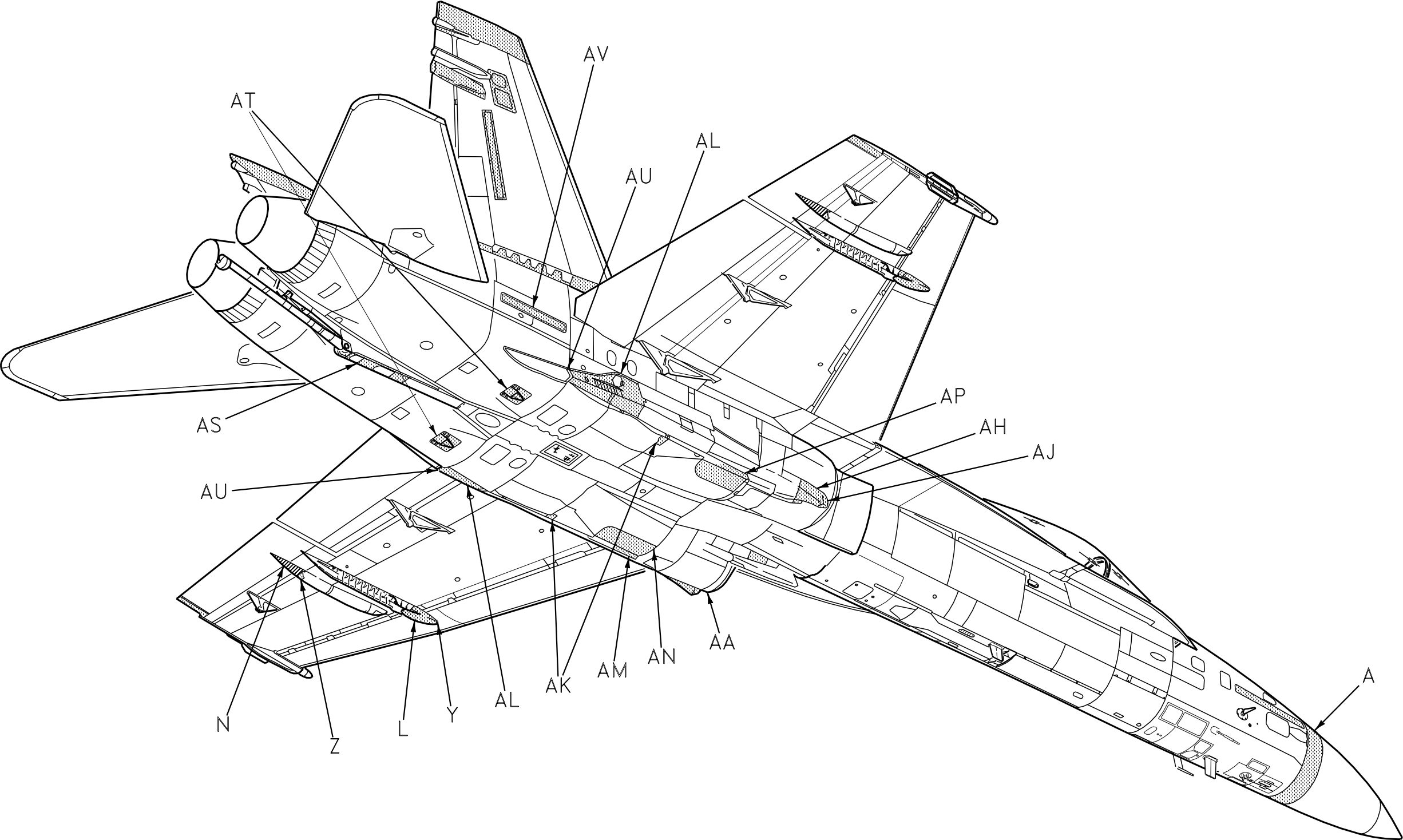
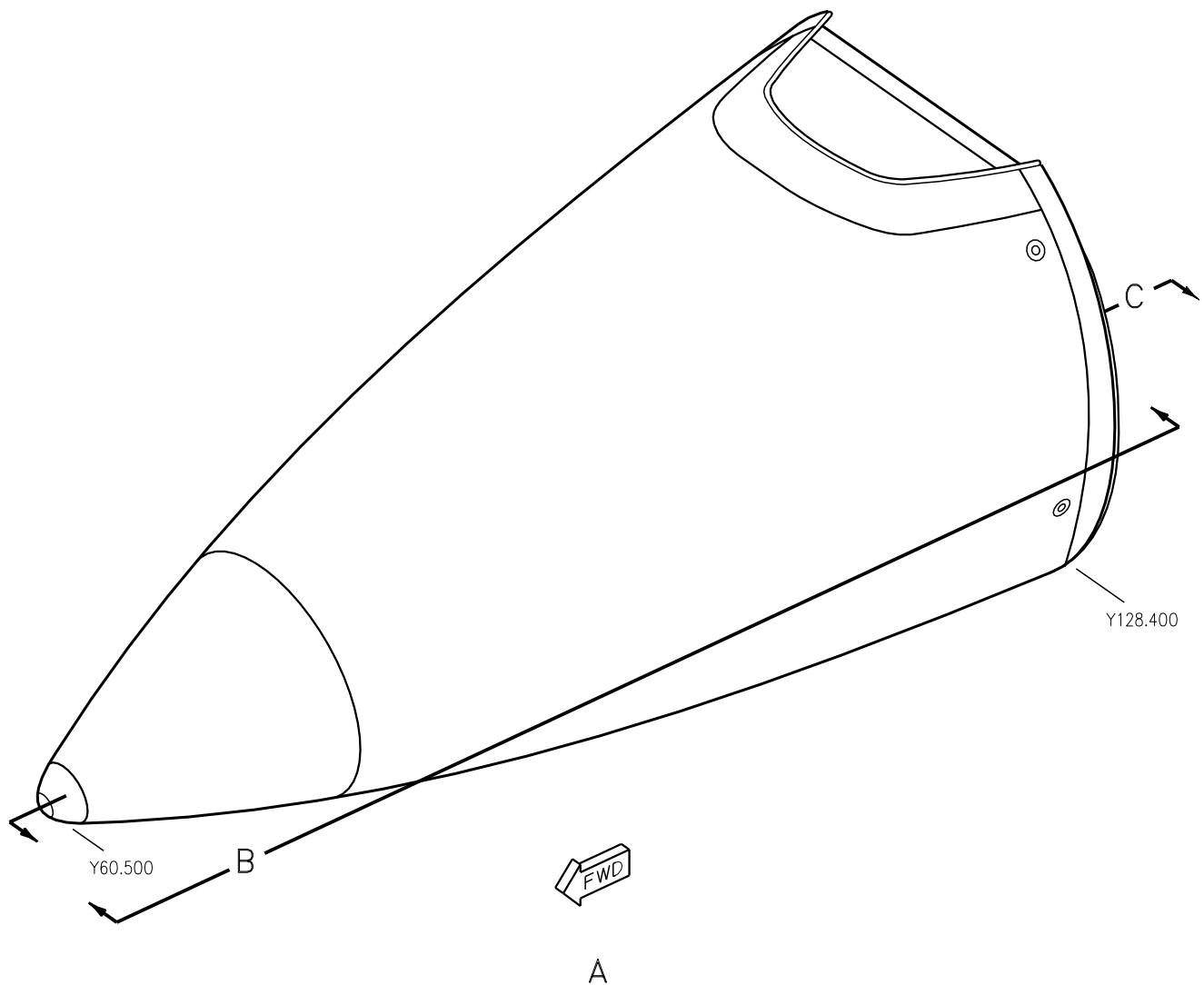


Figure 1.

Figure 1. Location of Conductive Coating (Sheet 2)

18AC-SRM-25-(78-2)36-CAT1

Figure 1.



**Figure 1. Location of Conductive Coating (Sheet 3)**

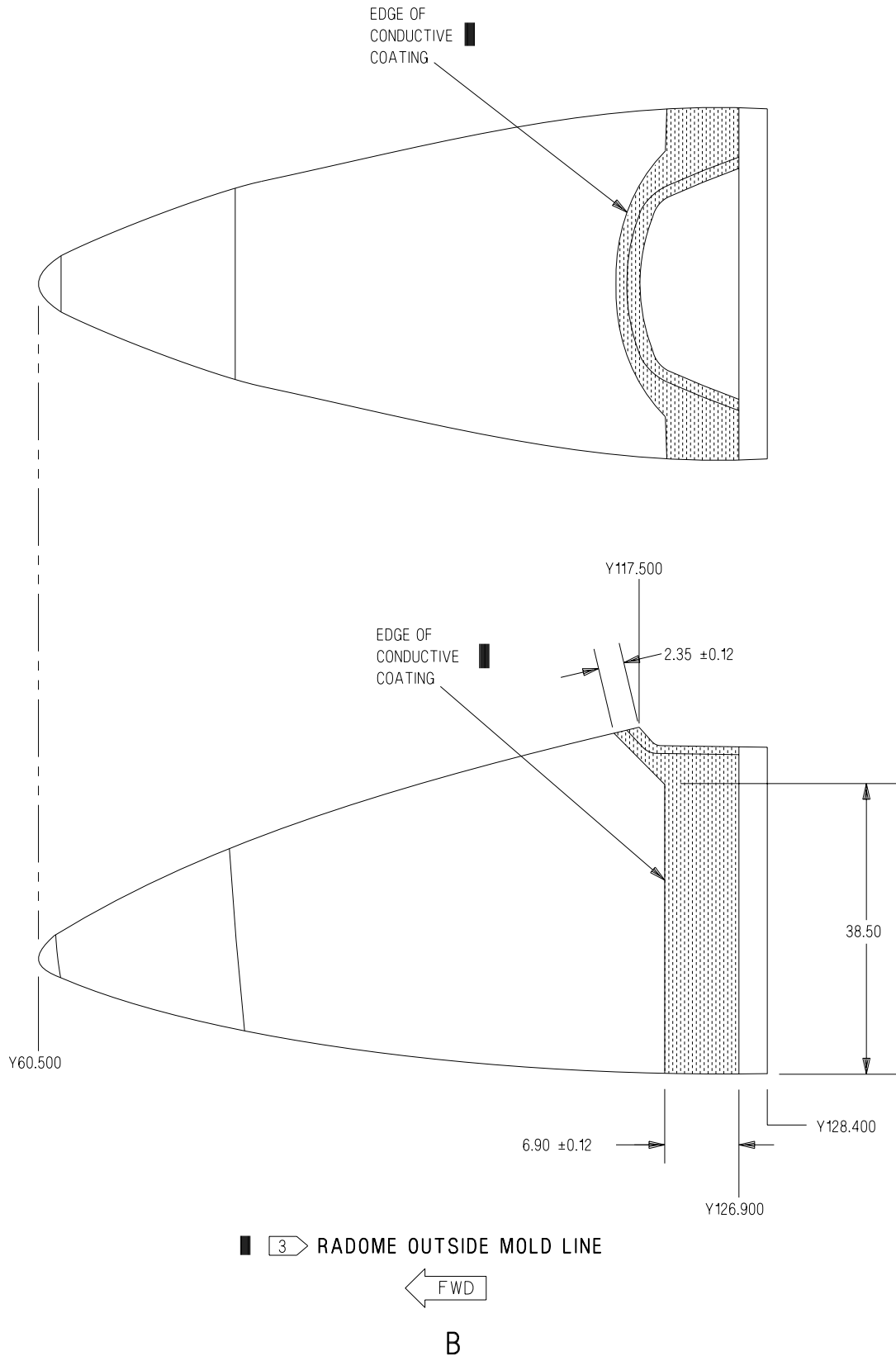


Figure 1. Location of Conductive Coating (Sheet 4)

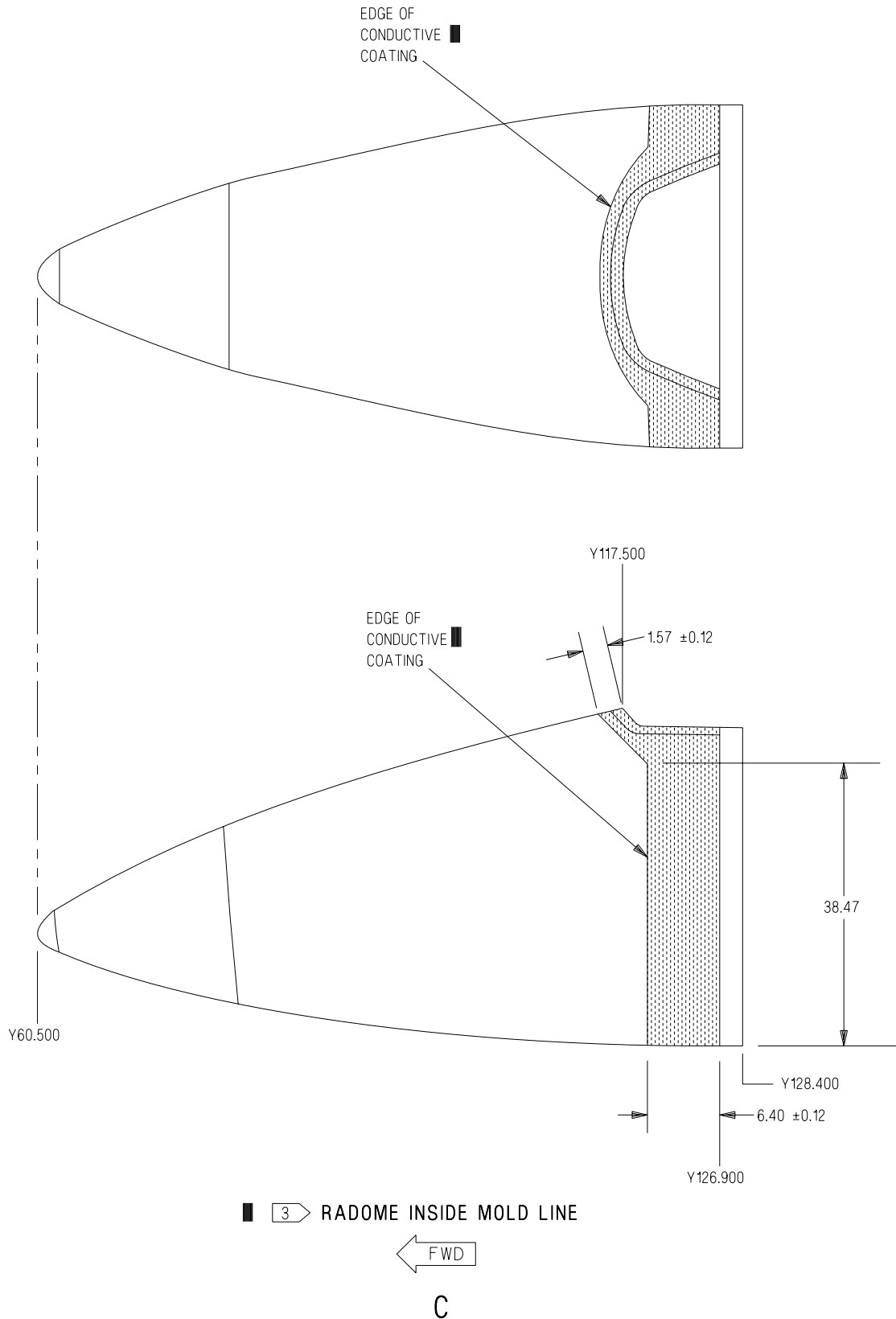
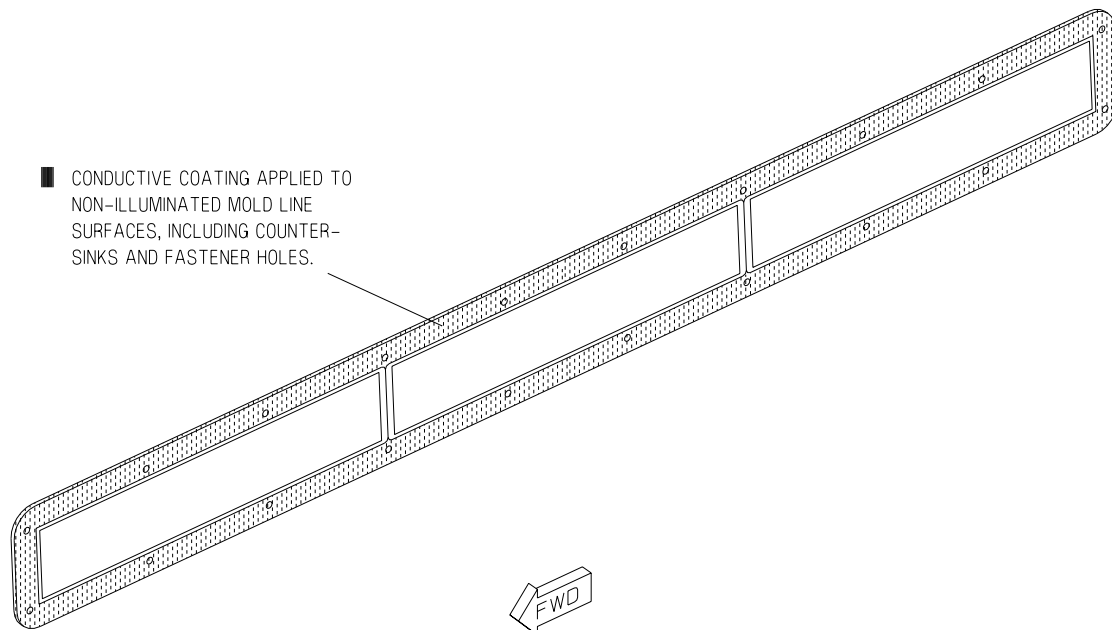
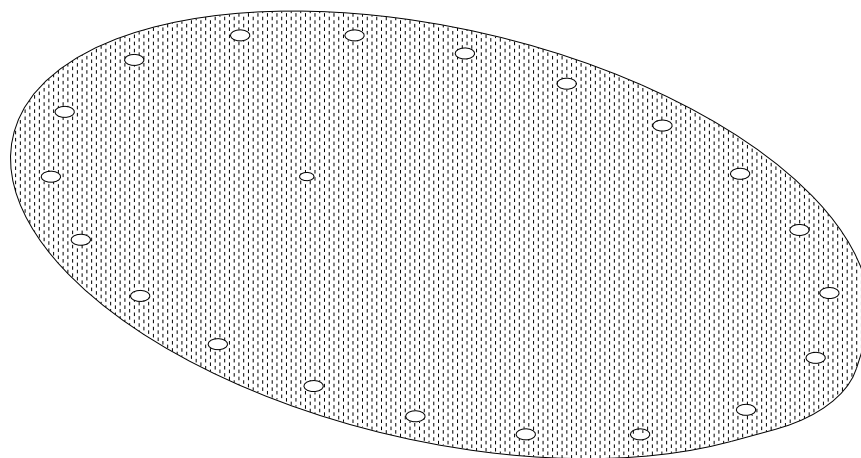


Figure 1. Location of Tin/Zinc Coating (Sheet 5)



D

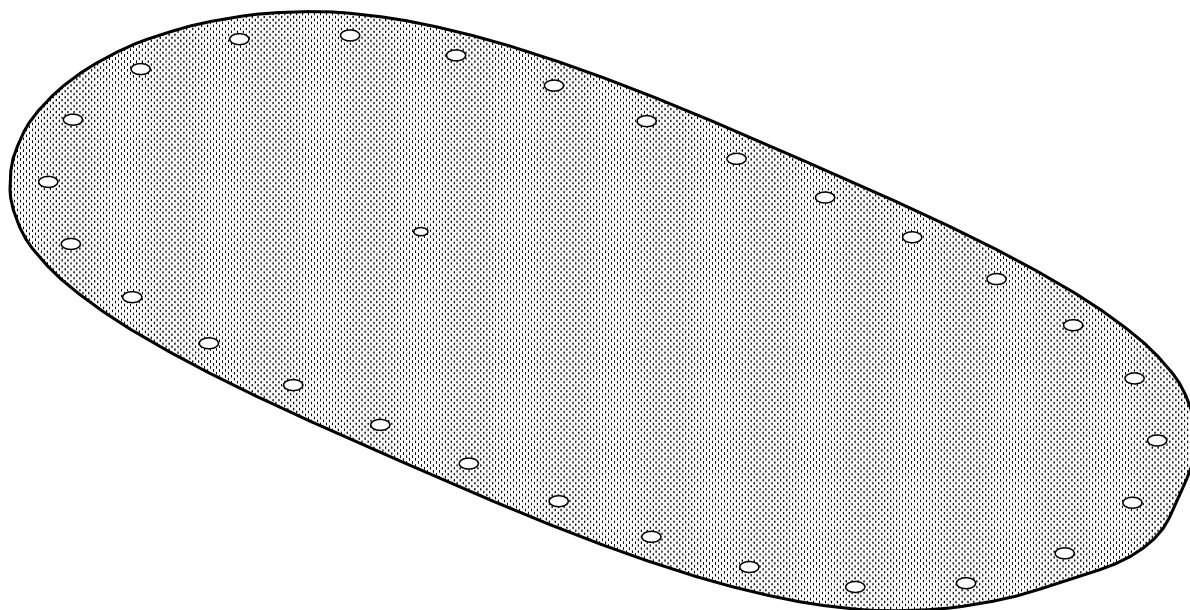
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L/H SHOWN, R/H TYPICAL



E

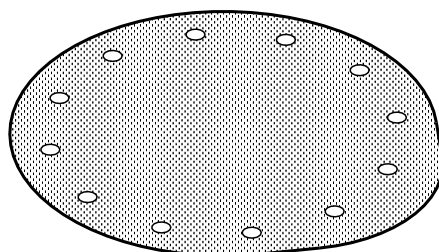
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**Figure 1. Location of Conductive Coating (Sheet 6)**



F

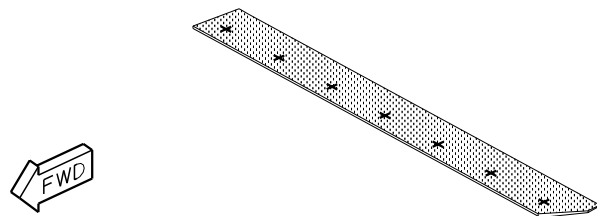
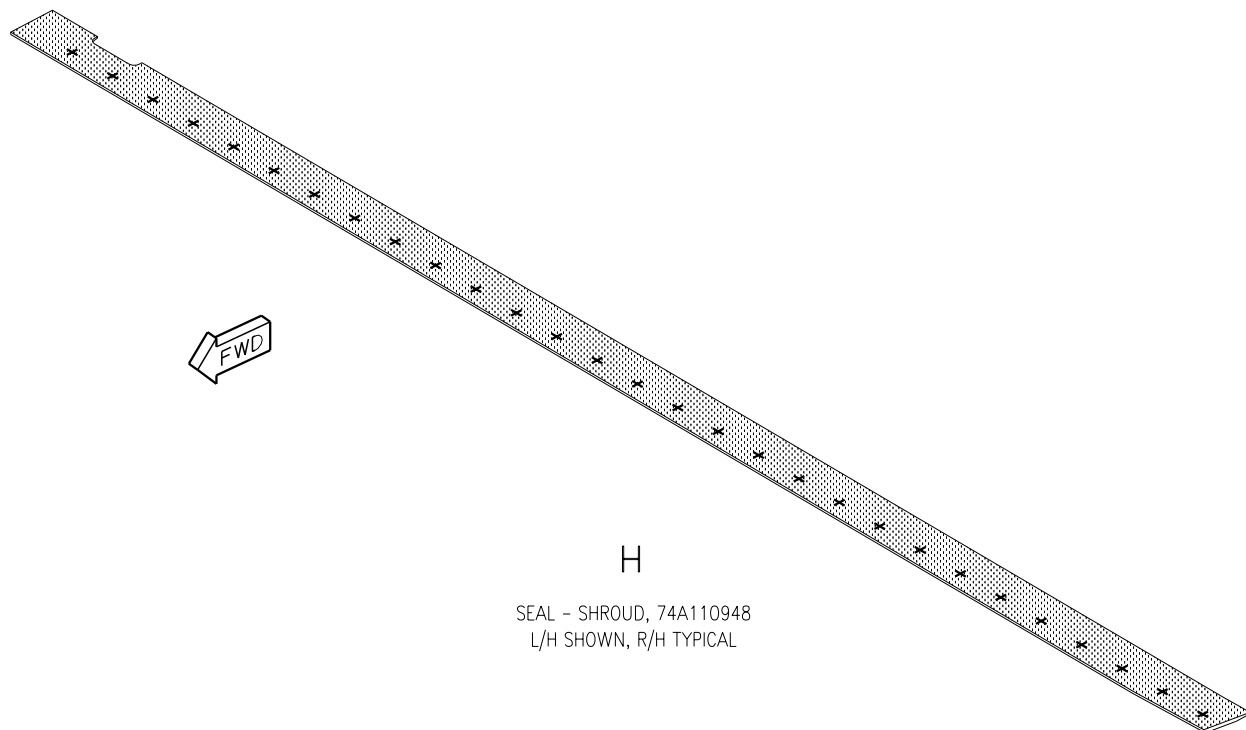
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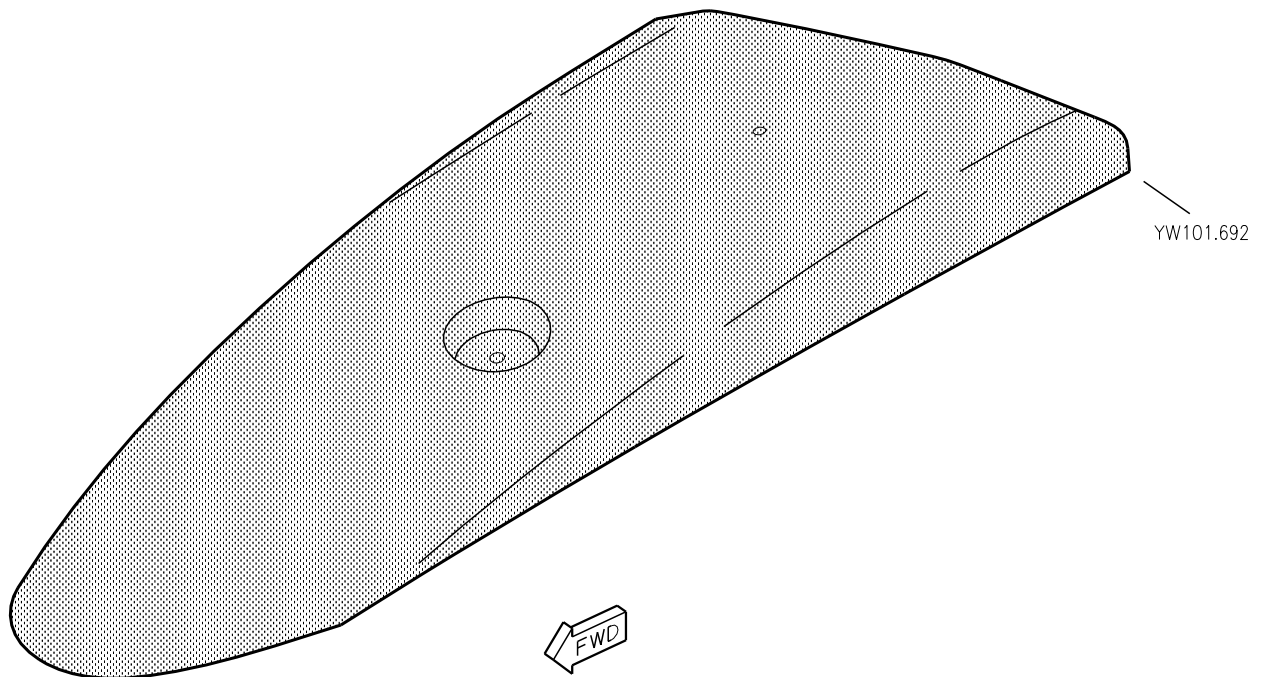
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DOOR 106, 74A110828  
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**Figure 1. Location of Conductive Coating (Sheet 7)**

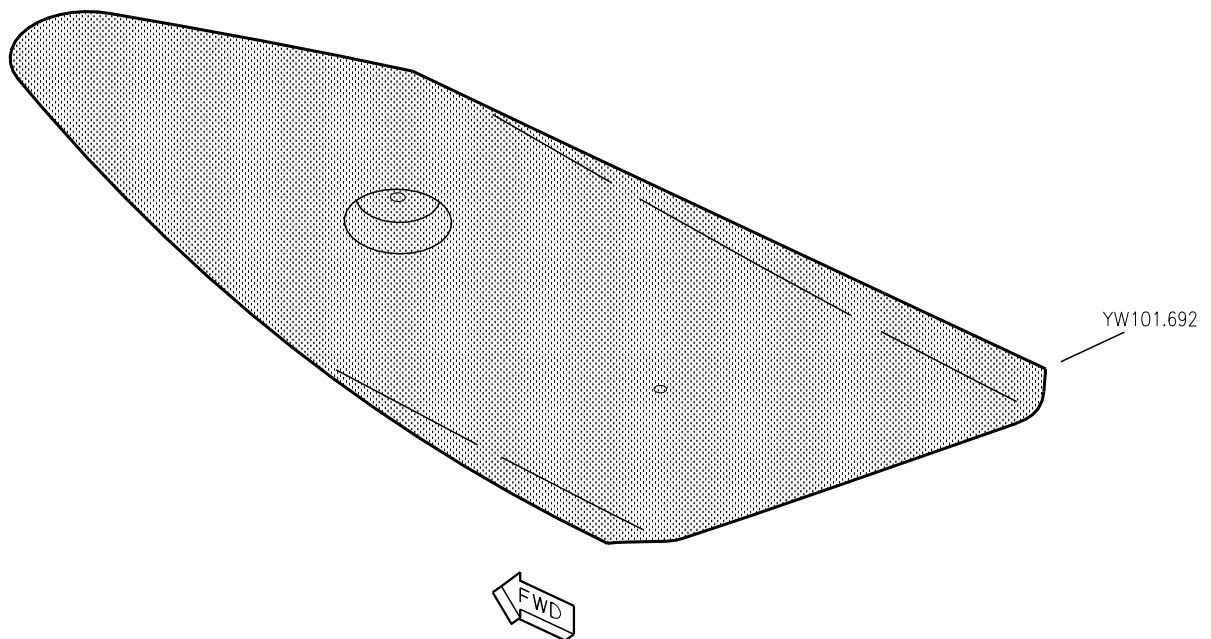


**Figure 1. Location of Conductive Coating (Sheet 8)**



K

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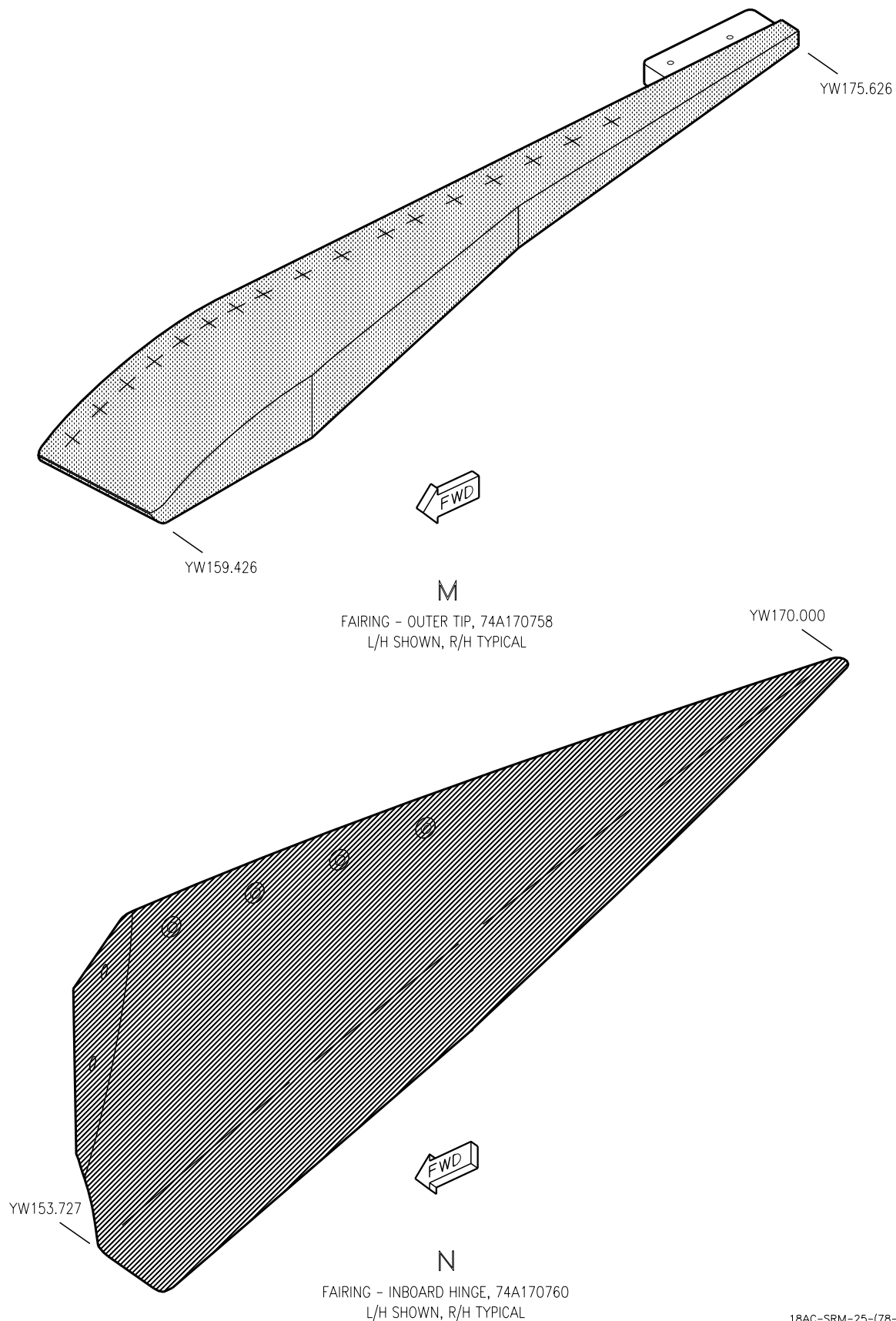


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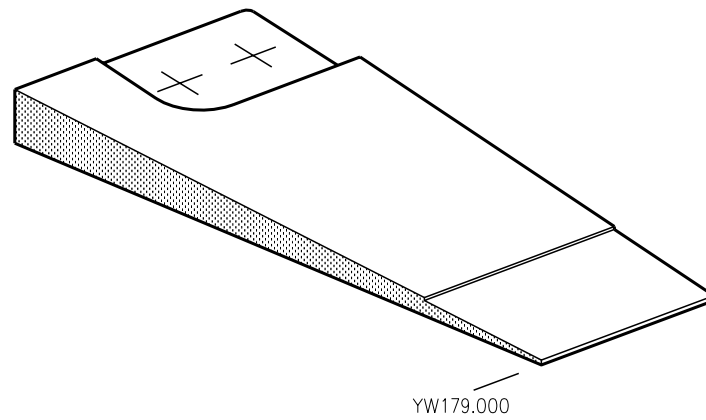
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**Figure 1. Location of Conductive Coating (Sheet 9)**



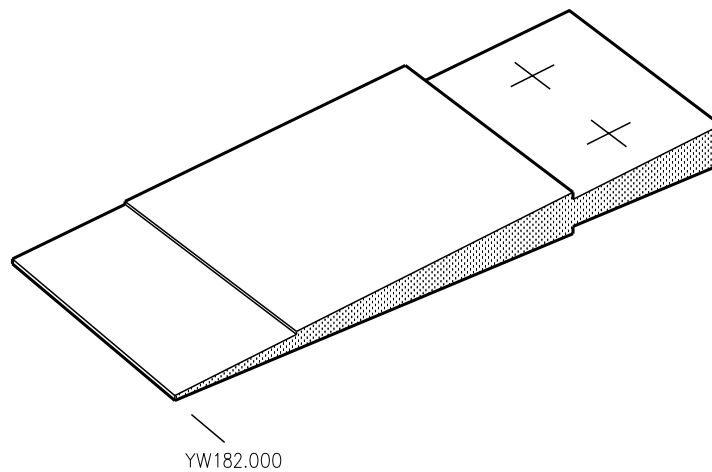


**Figure 1. Location of Conductive Coating (Sheet 10)**



P

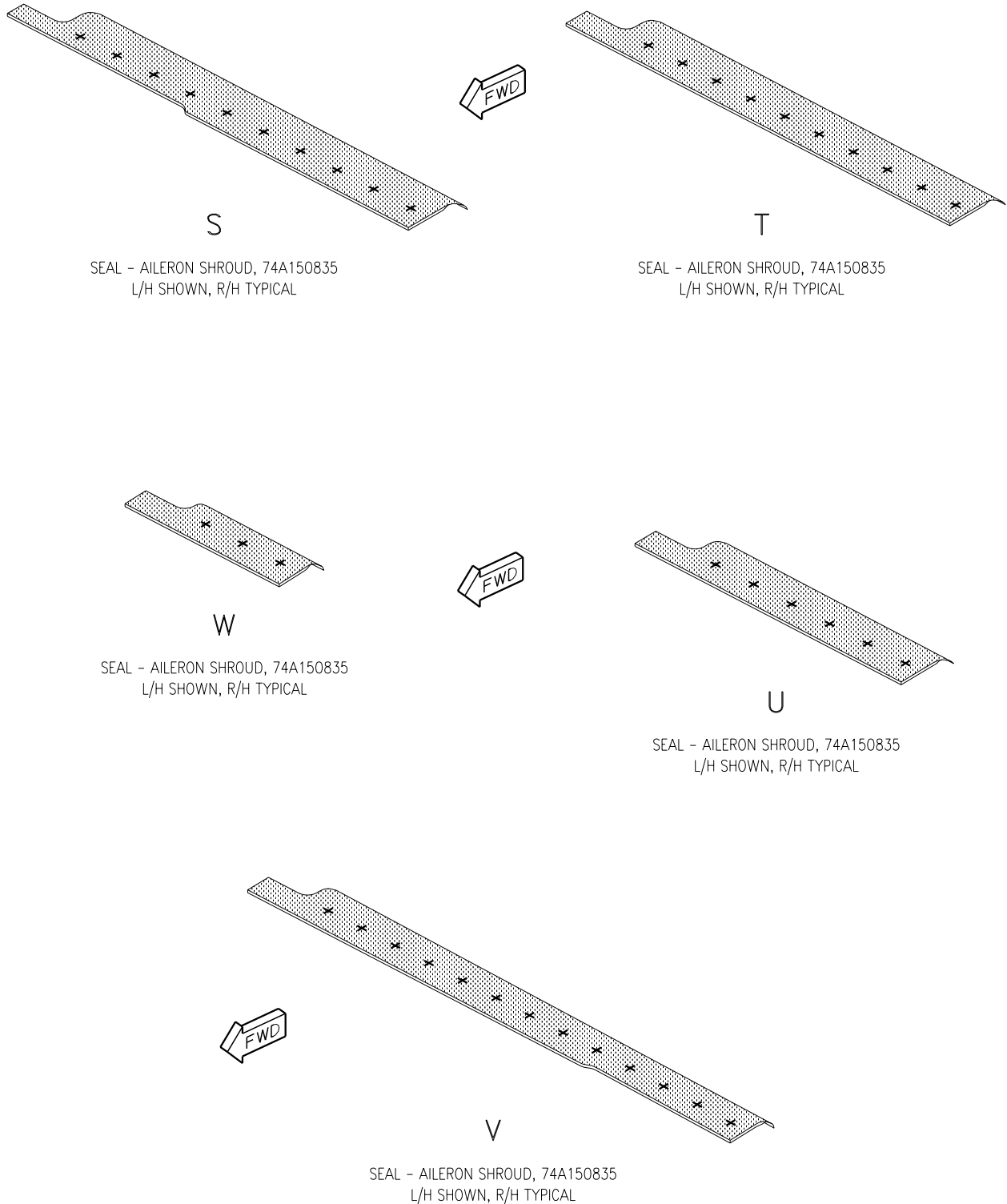
ARROWHEAD CLOSURE RIB, 74A170633  
L/H SHOWN, R/H TYPICAL



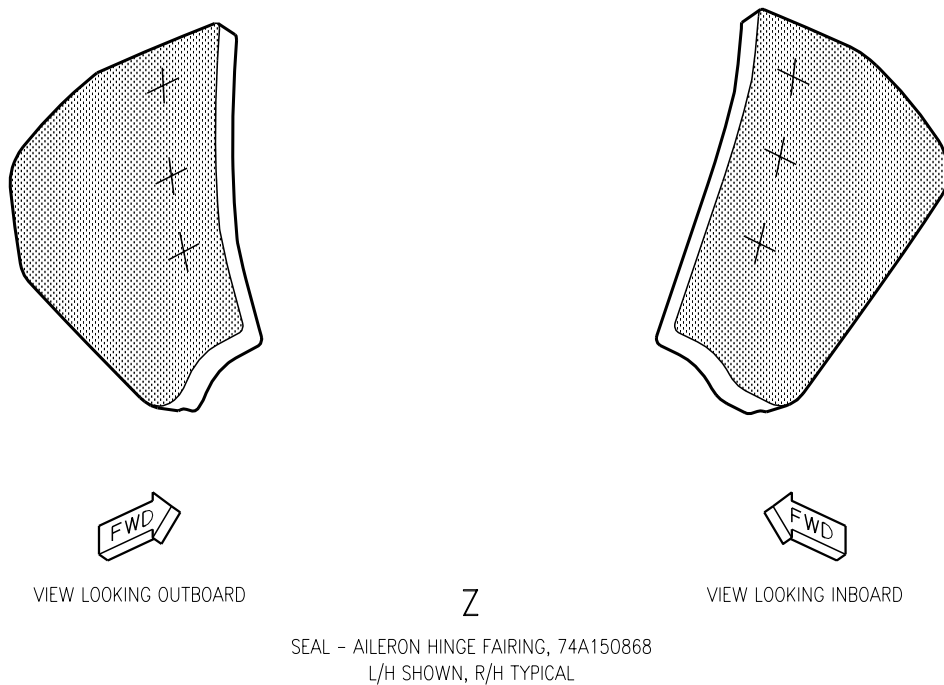
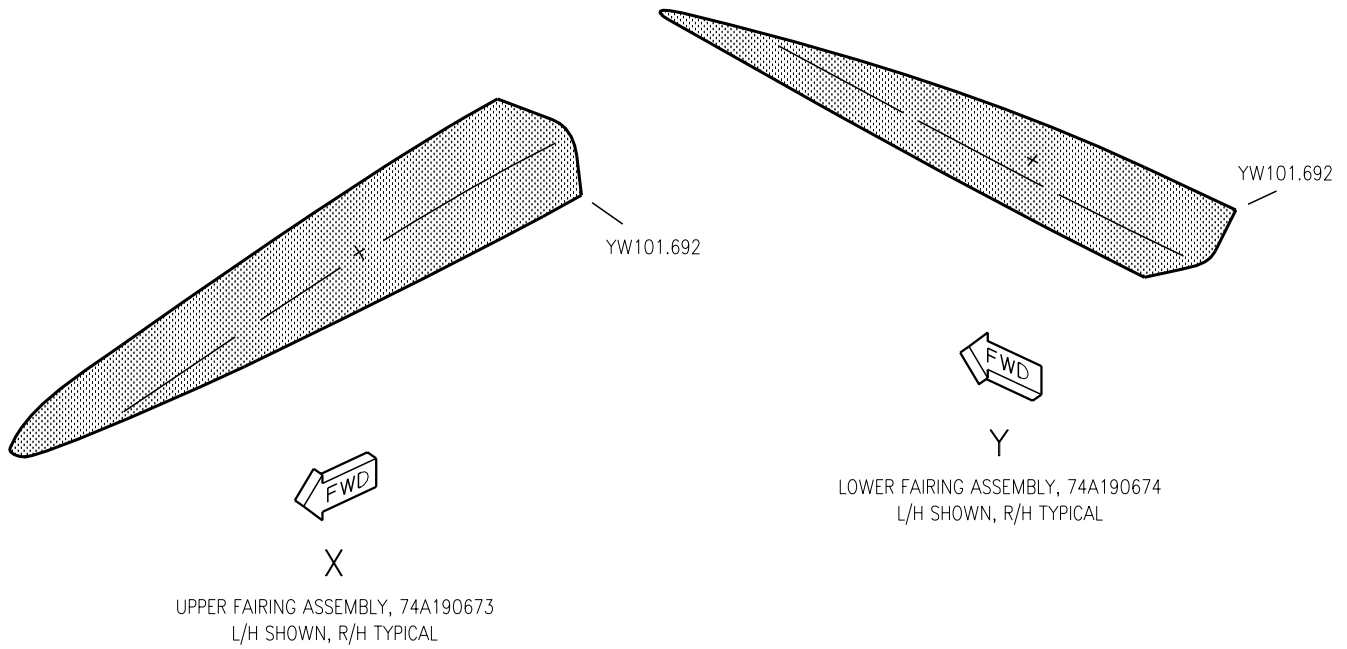
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ARROWHEAD CLOSURE RIB, 74A170633  
L/H SHOWN, R/H TYPICAL

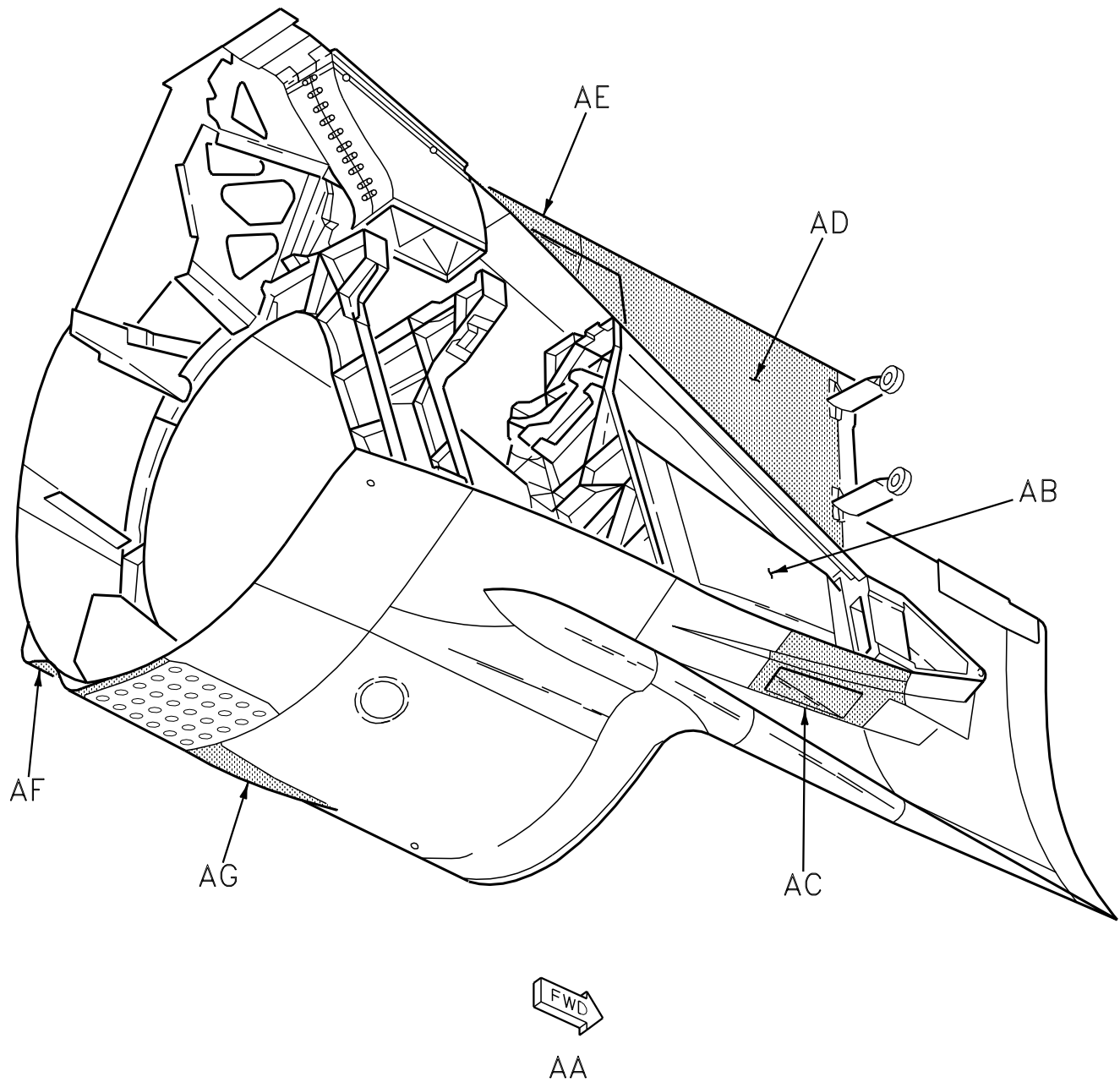
**Figure 1. Location of Conductive Coating (Sheet 11)**



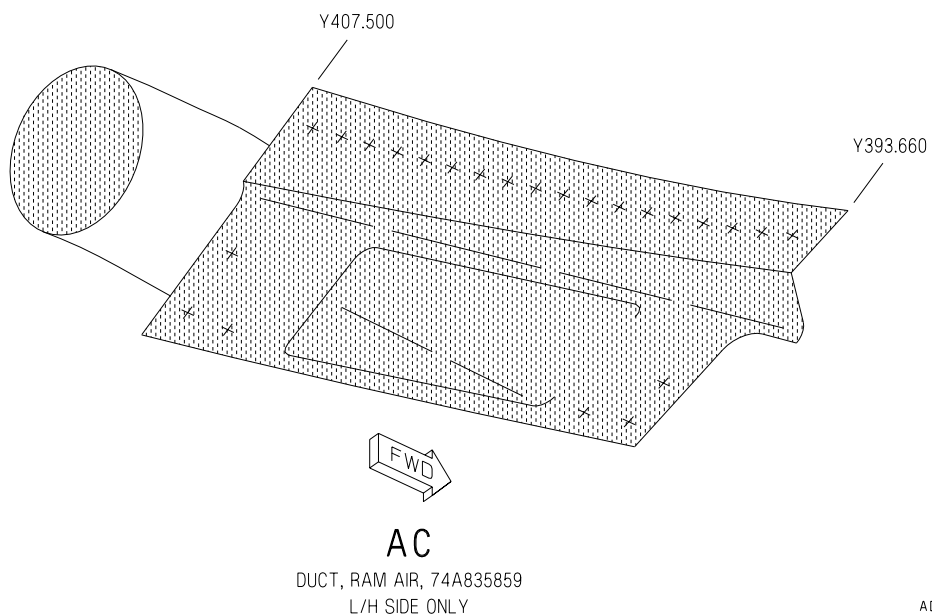
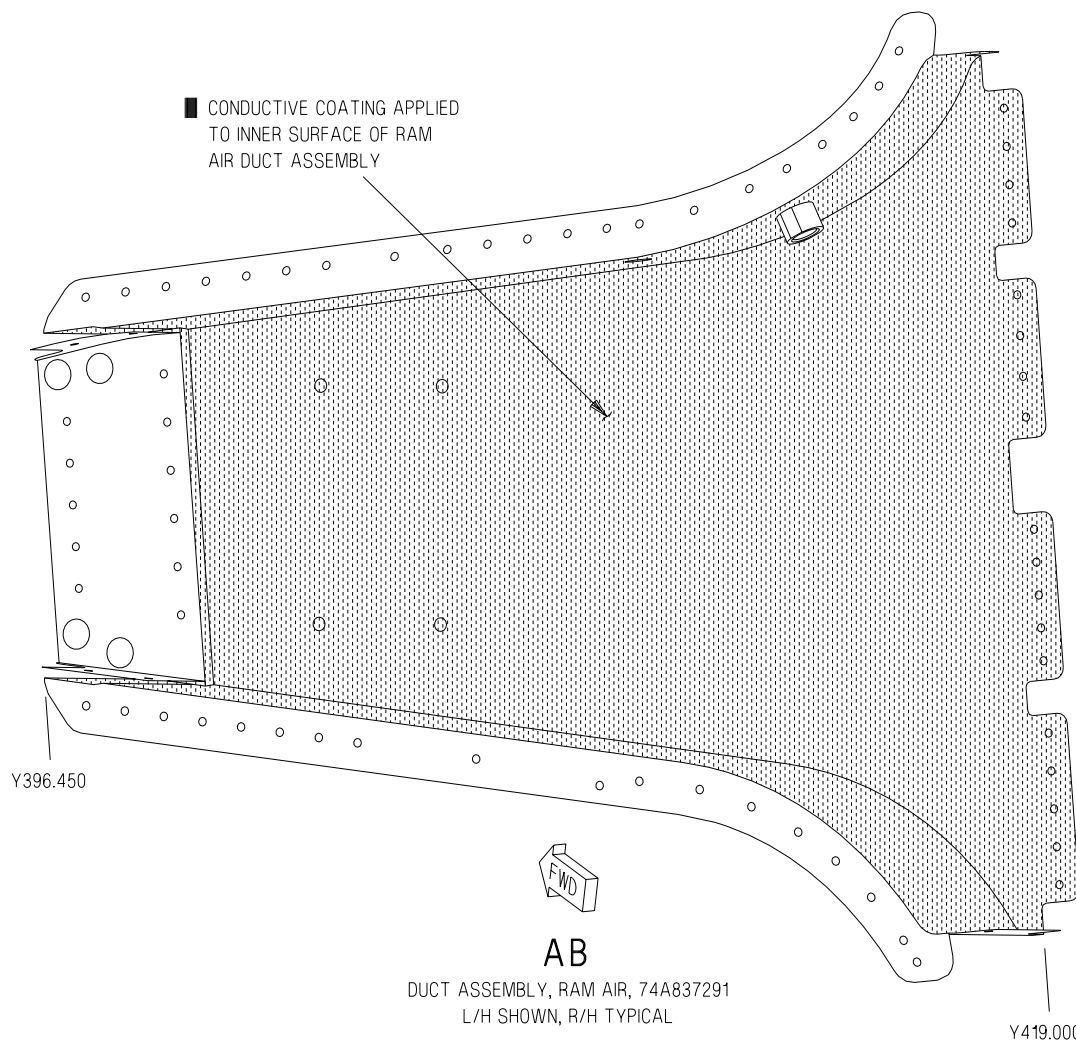
**Figure 1. Location of Conductive Coating (Sheet 12)**



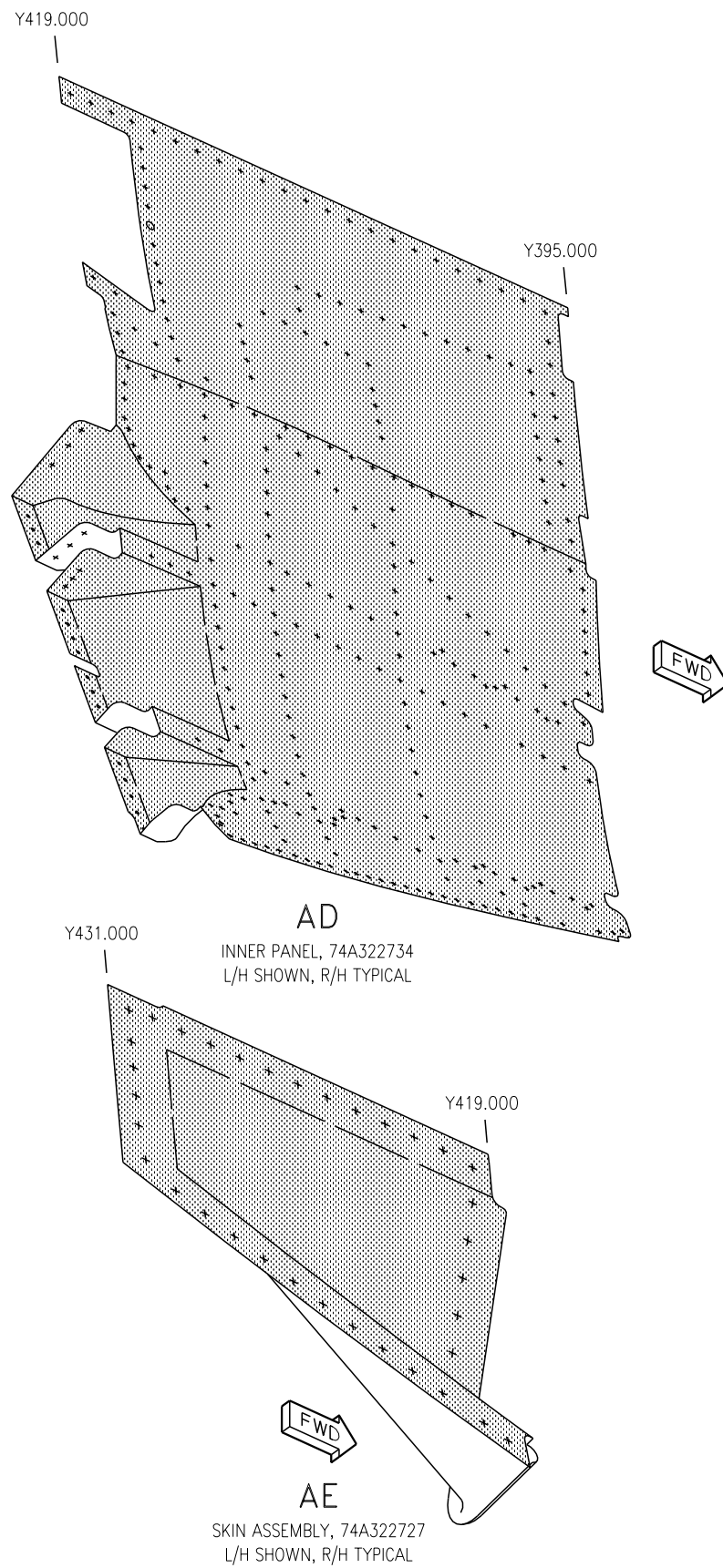
**Figure 1. Location of Conductive Coating (Sheet 13)**



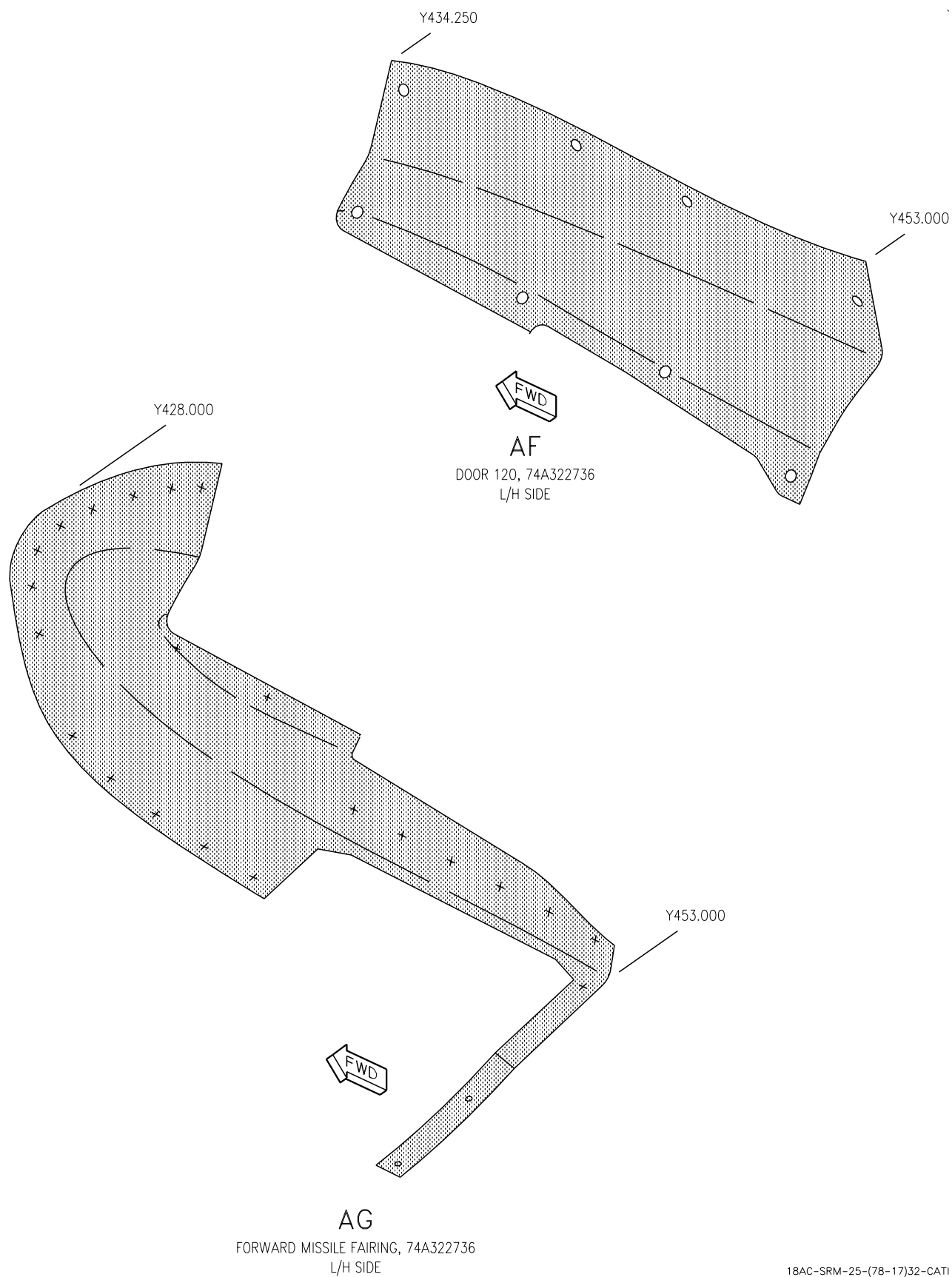
**Figure 1. Location of Conductive Coating (Sheet 14)**



**Figure 1. Location of Conductive Coating (Sheet 15)**

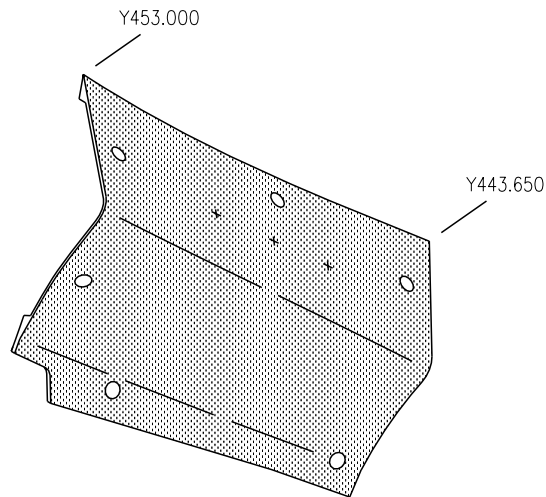


**Figure 1. Location of Conductive Coating (Sheet 16)**



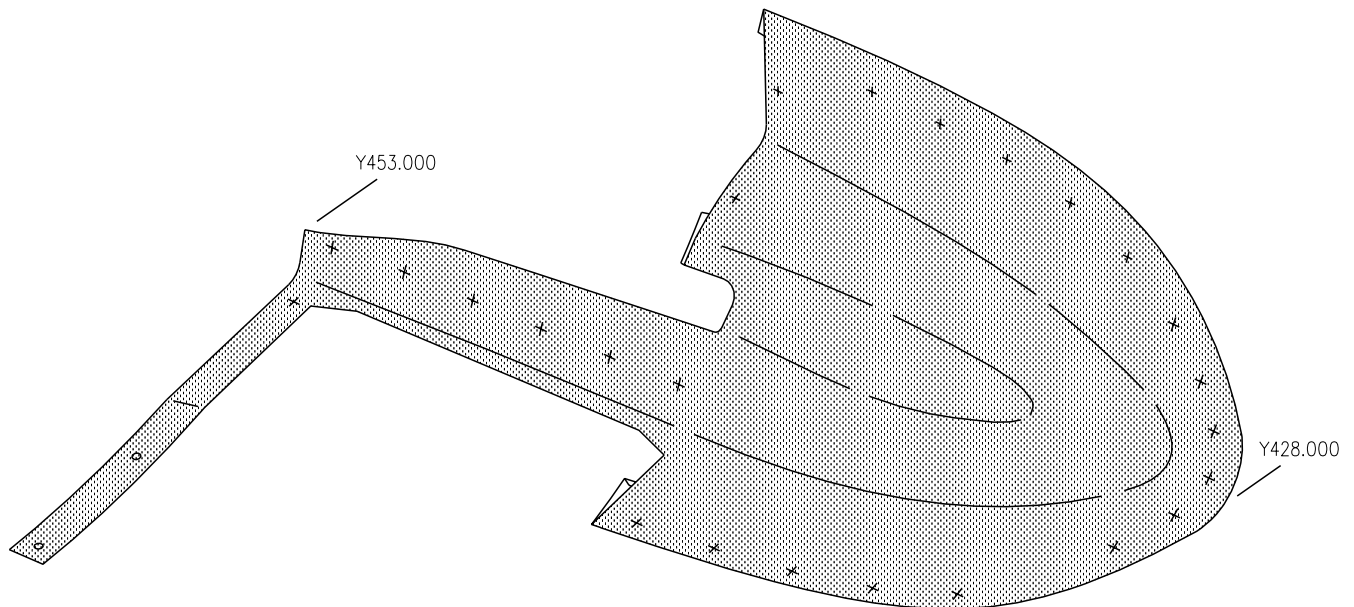
**Figure 1. Location of Conductive Coating (Sheet 17)**





AH

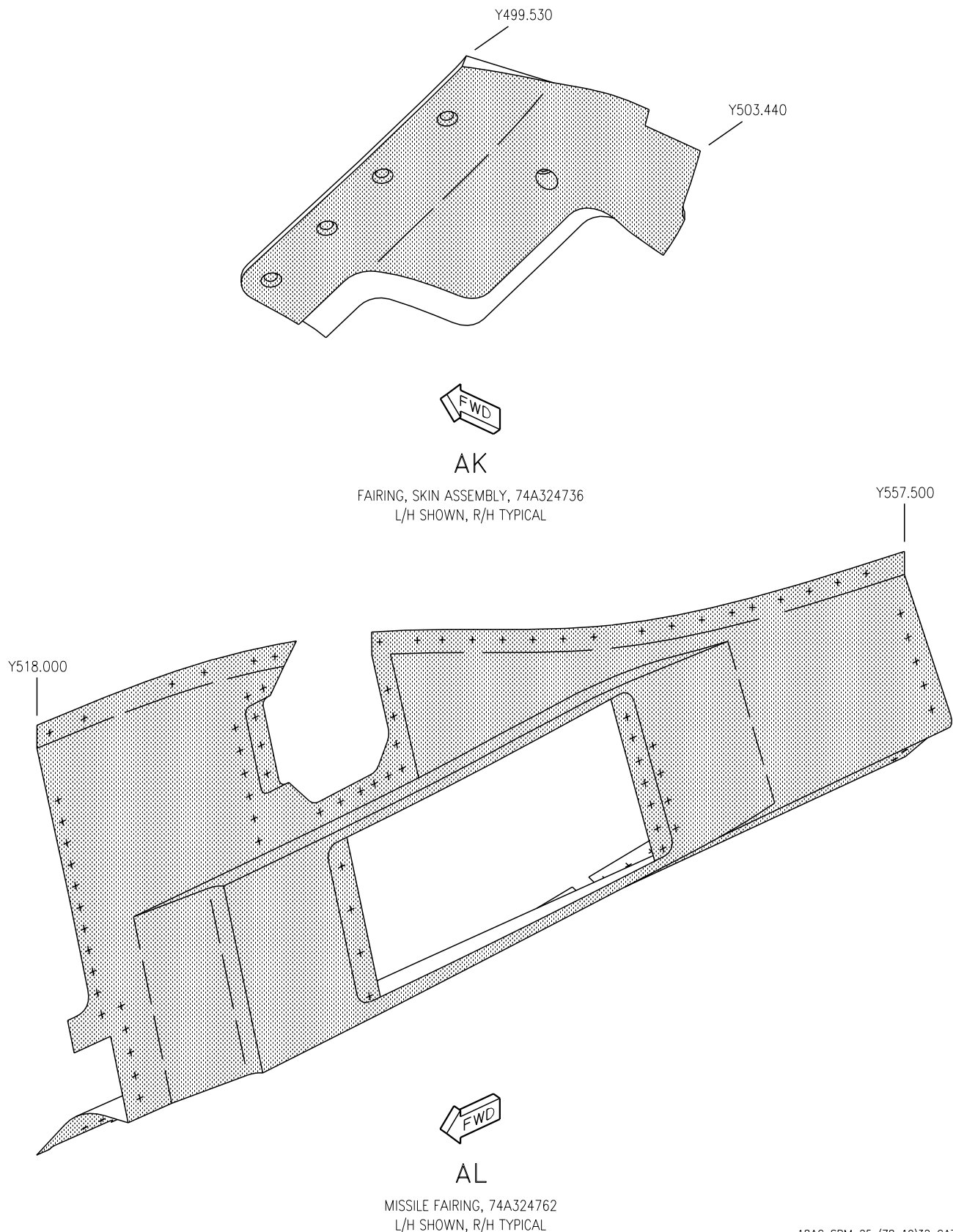
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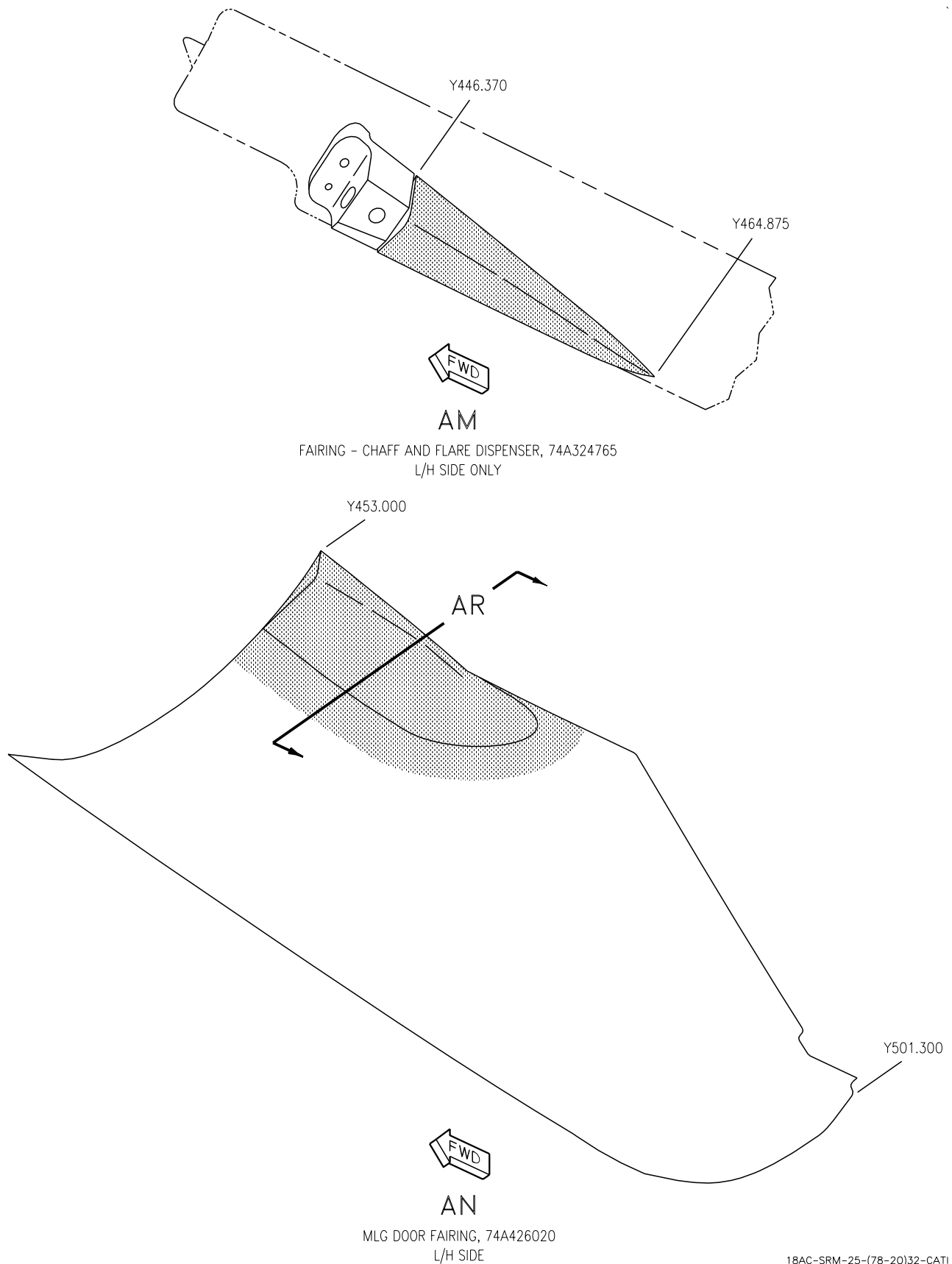
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FORWARD MISSILE FAIRING, 74A322736  
R/H SIDE

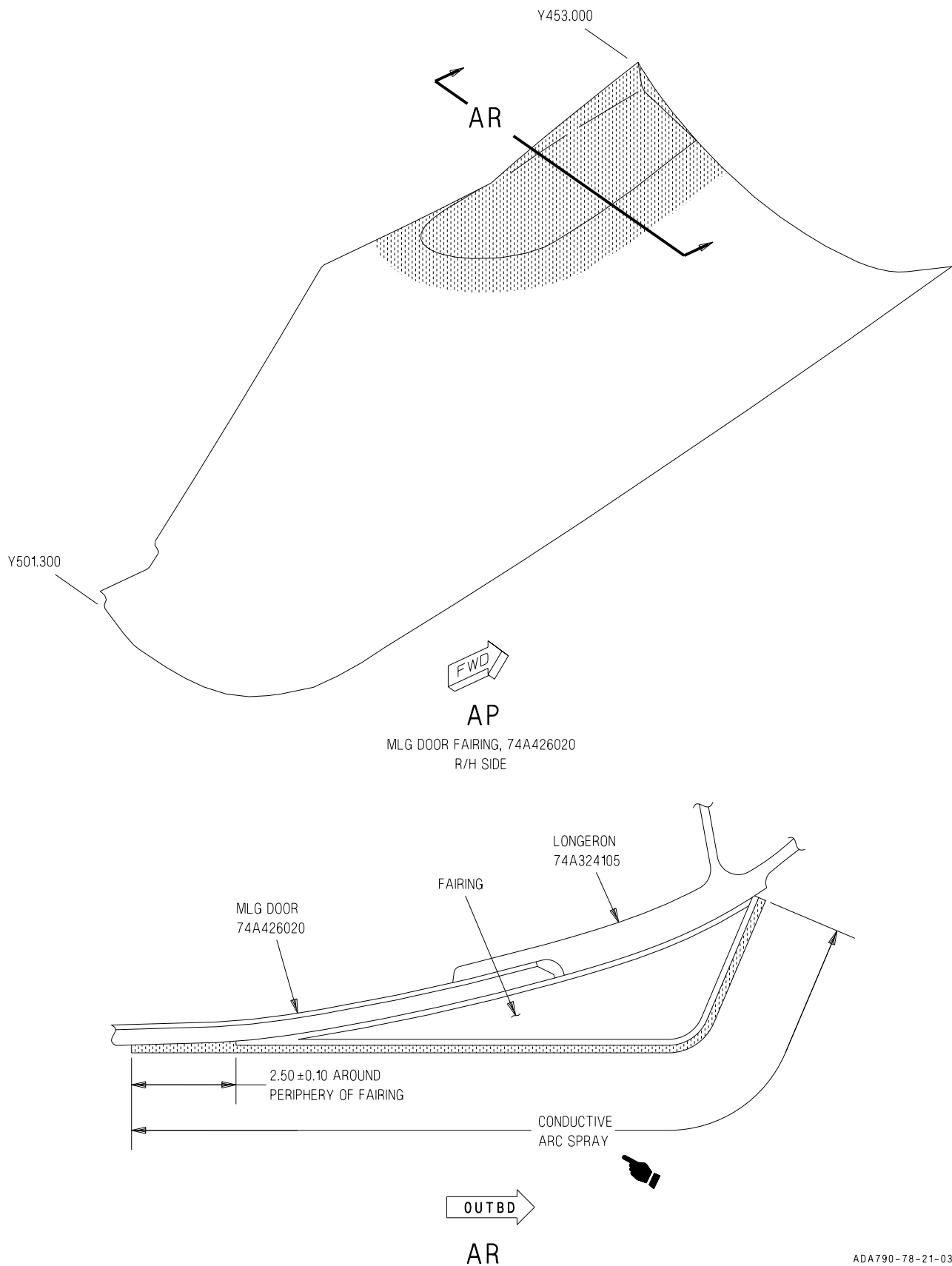
**Figure 1. Location of Conductive Coating (Sheet 18)**



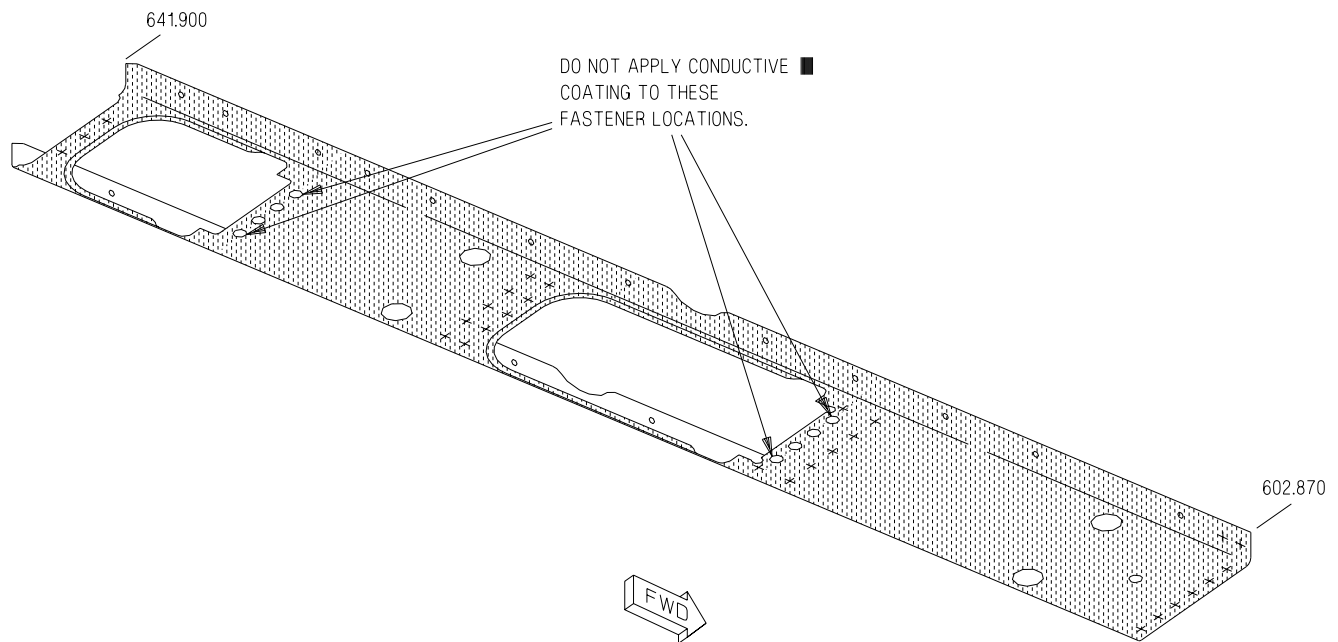
**Figure 1. Location of Conductive Coating (Sheet 19)**



**Figure 1. Location of Conductive Coating (Sheet 20)**

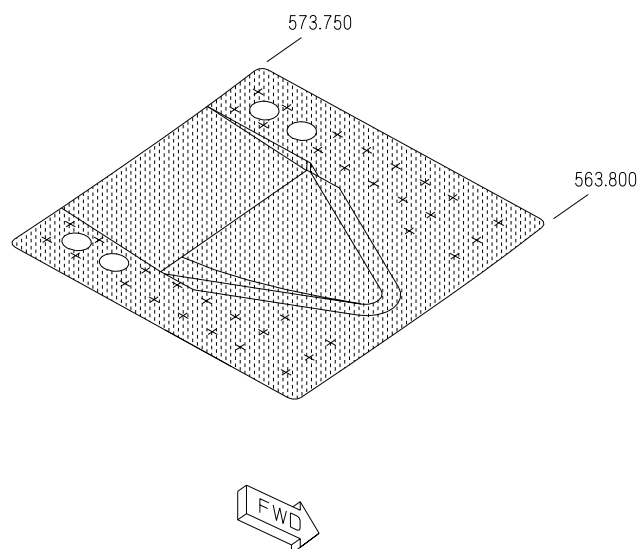


**Figure 1. Location of Conductive Coating (Sheet 21)**



AS

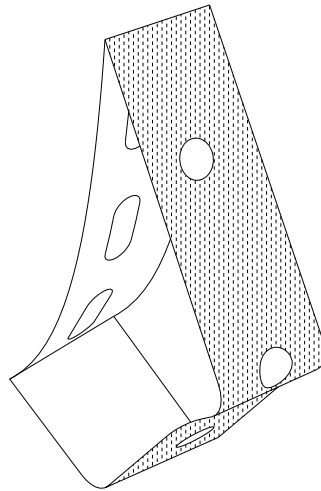
ARRESTING HOOK FAIRING, 74A332518



AT

DOOR 65, 74A330643  
L/H SHOWN, R/H TYPICAL

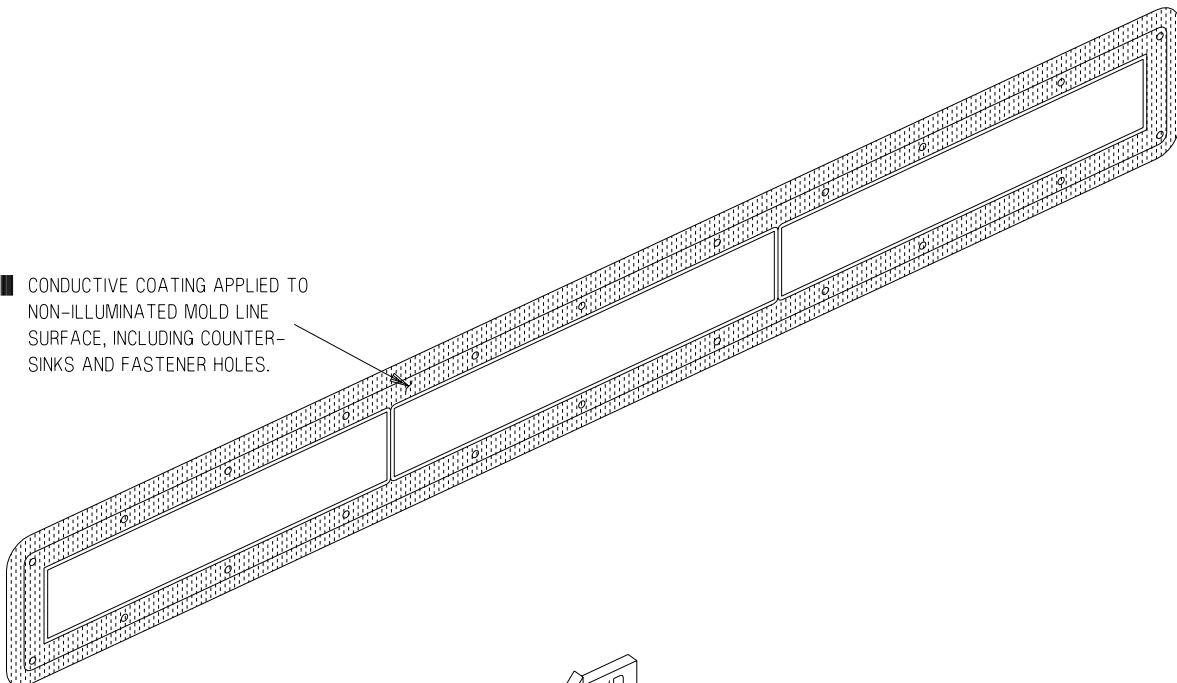
**Figure 1. Location of Conductive Coating (Sheet 22)**



AU

MISSILE FAIRING TRANSITION, 74A330649  
L/H SHOWN, R/H TYPICAL

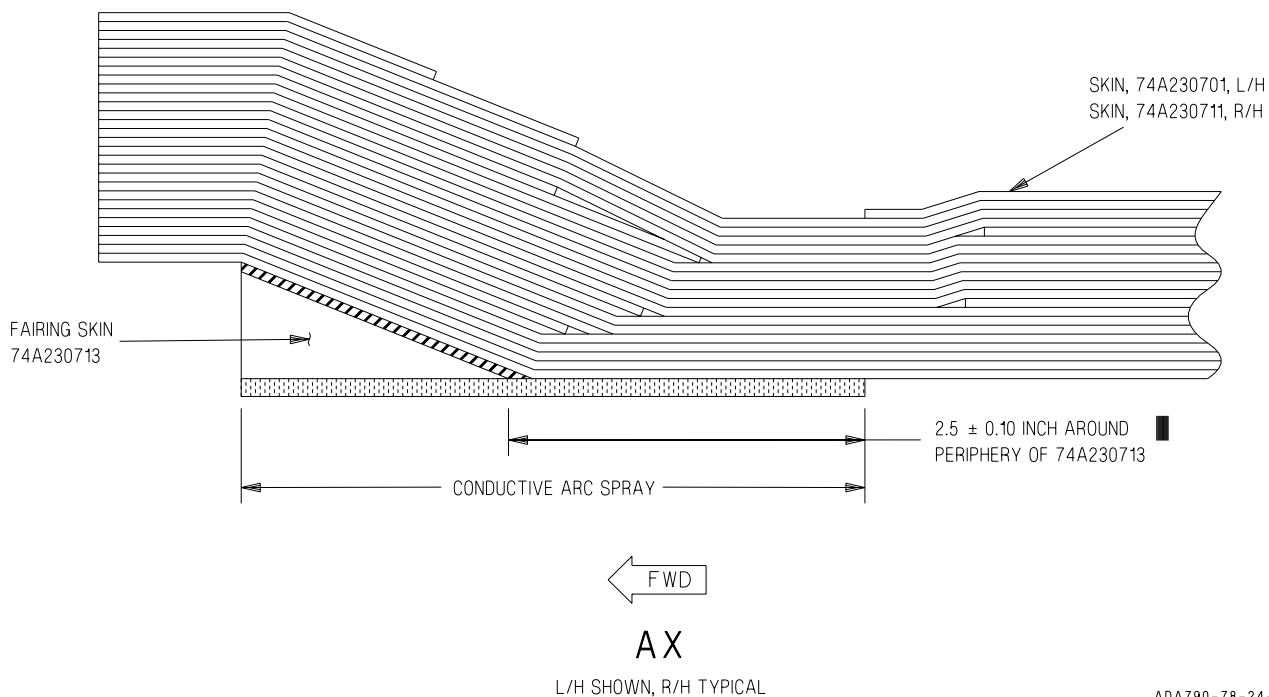
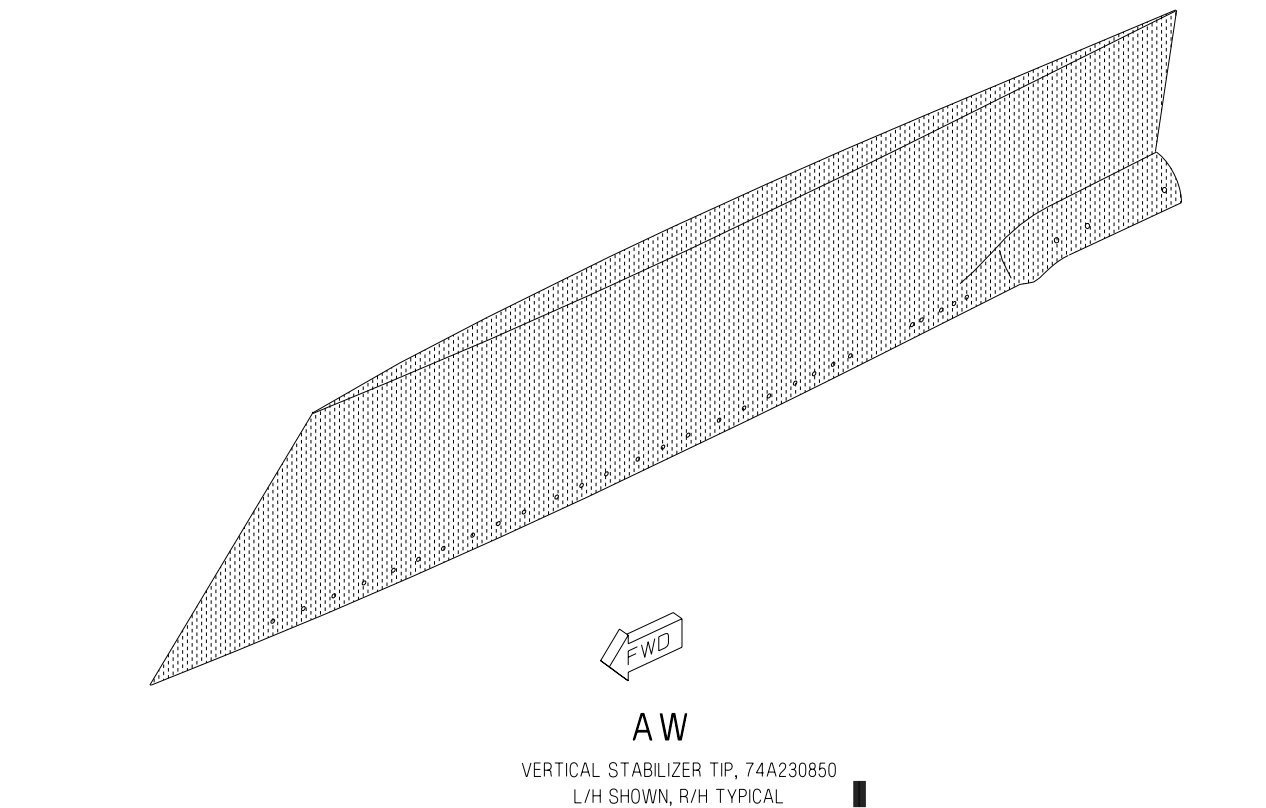
■ CONDUCTIVE COATING APPLIED TO  
NON-ILLUMINATED MOLD LINE  
SURFACE, INCLUDING COUNTER-  
SINKS AND FASTENER HOLES.



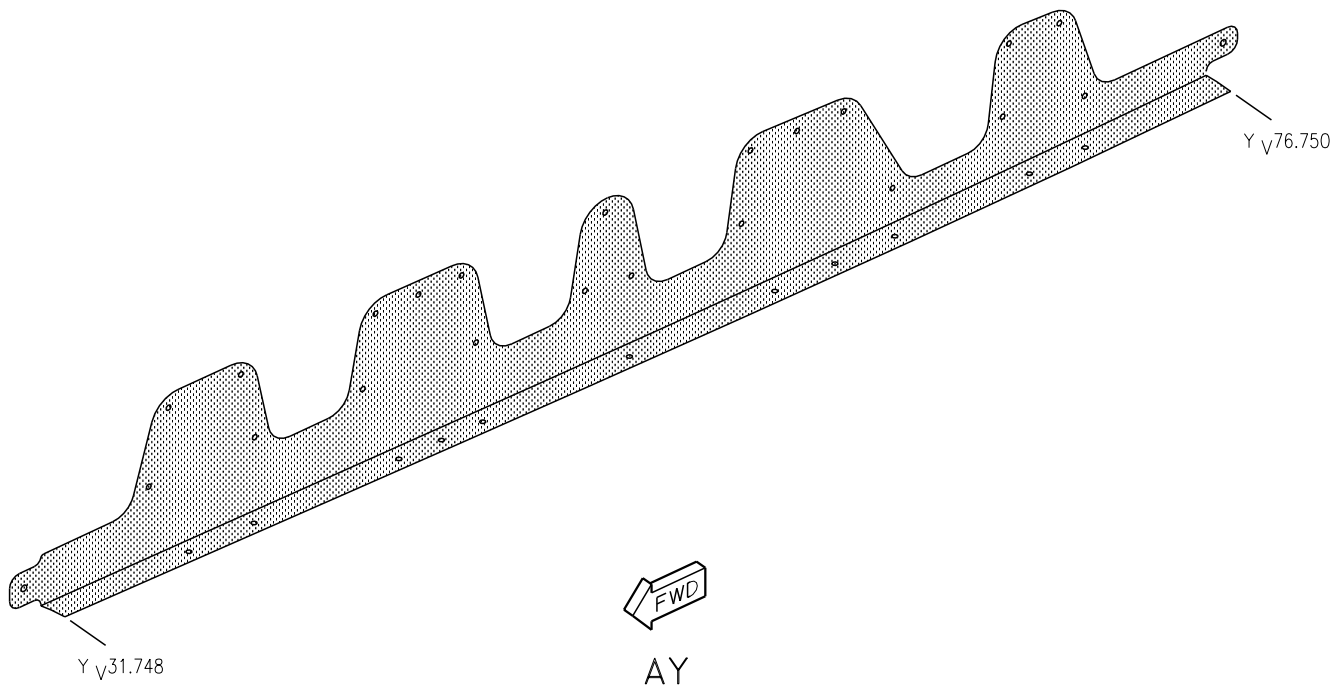
AV

FORMATION LIGHT, 5420-125  
L/H SHOWN, R/H TYPICAL

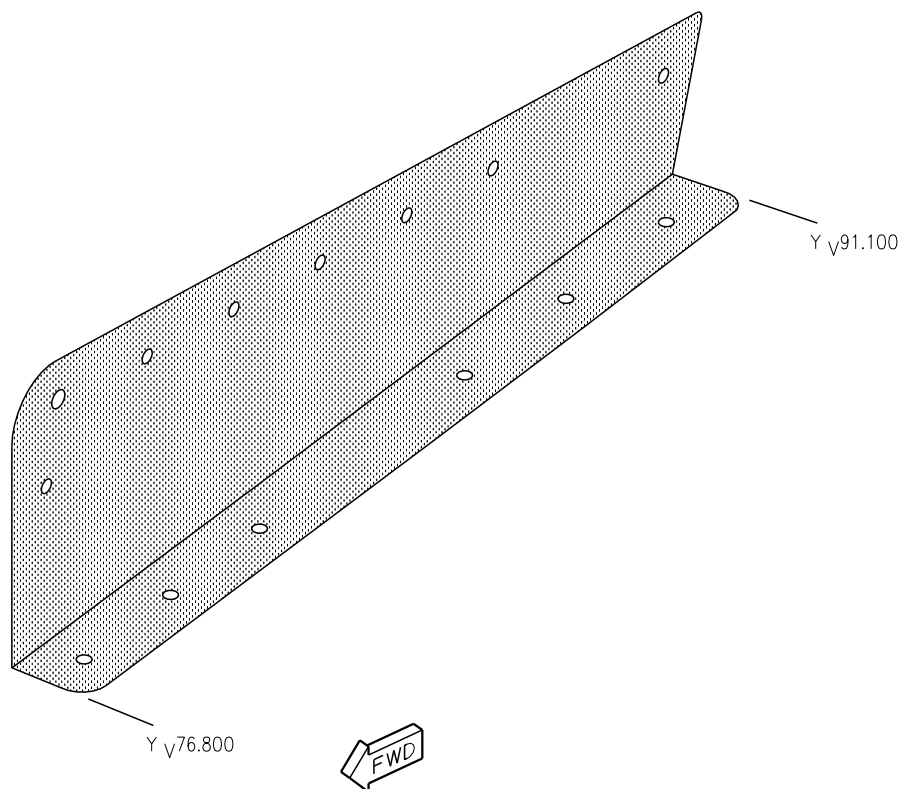
**Figure 1. Location of Conductive Coating (Sheet 23)**



**Figure 1. Location of Conductive Coating (Sheet 24)**



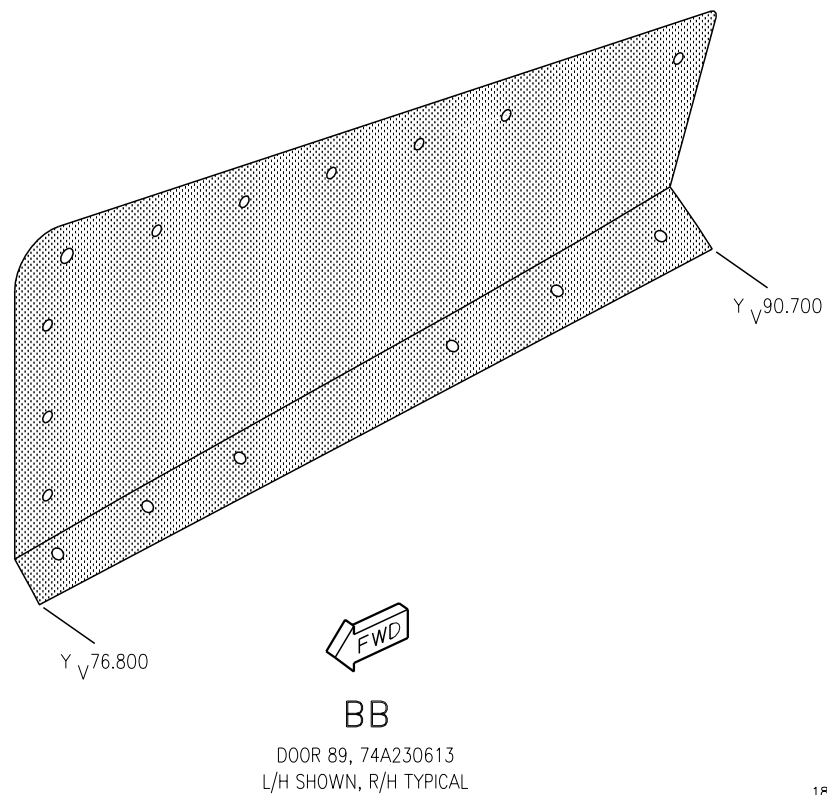
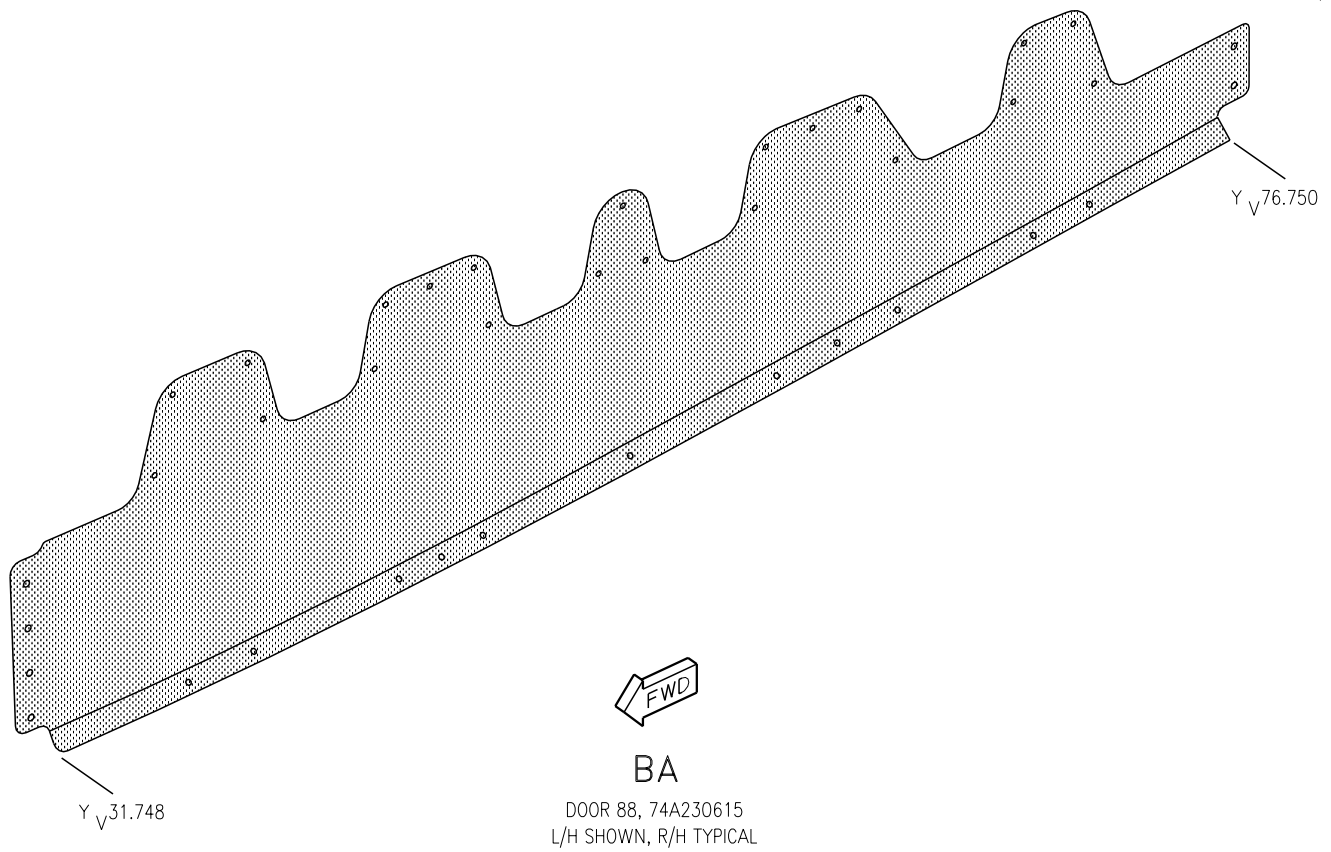
DOOR 86, 74A230612  
R/H SHOWN, L/H TYPICAL



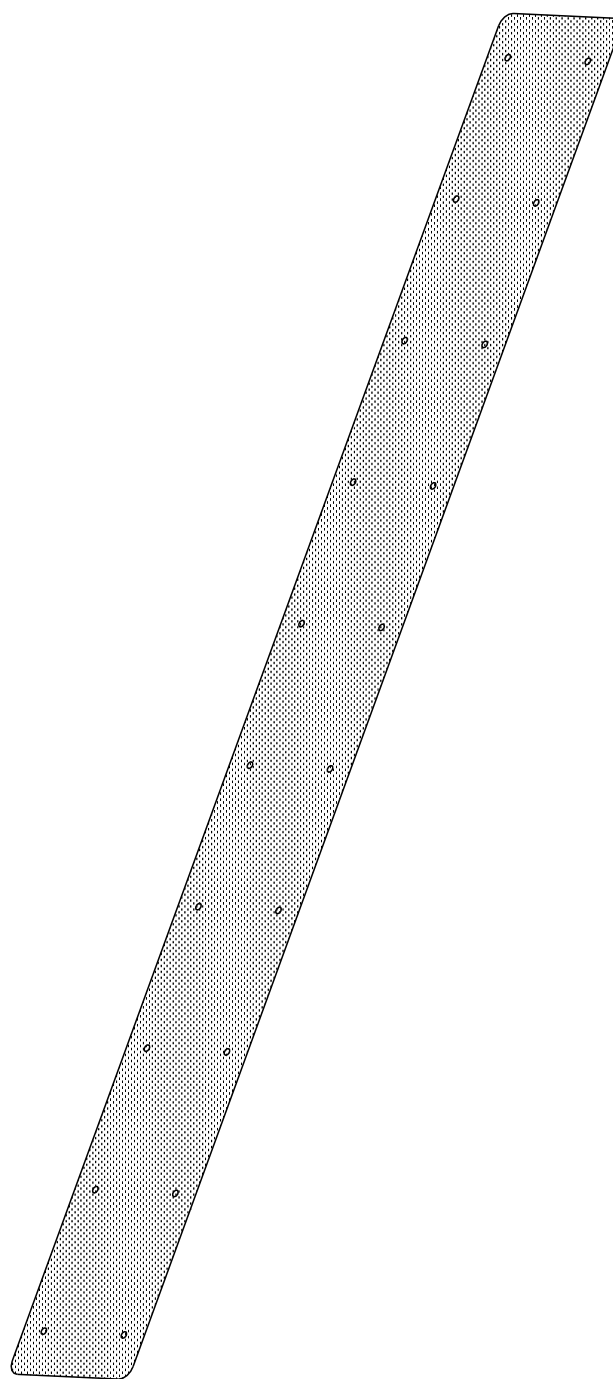
DOOR 87, 74A230610  
R/H SHOWN, L/H TYPICAL

**Figure 1. Location of Conductive Coating (Sheet 25)**





**Figure 1. Location of Conductive Coating (Sheet 26)**



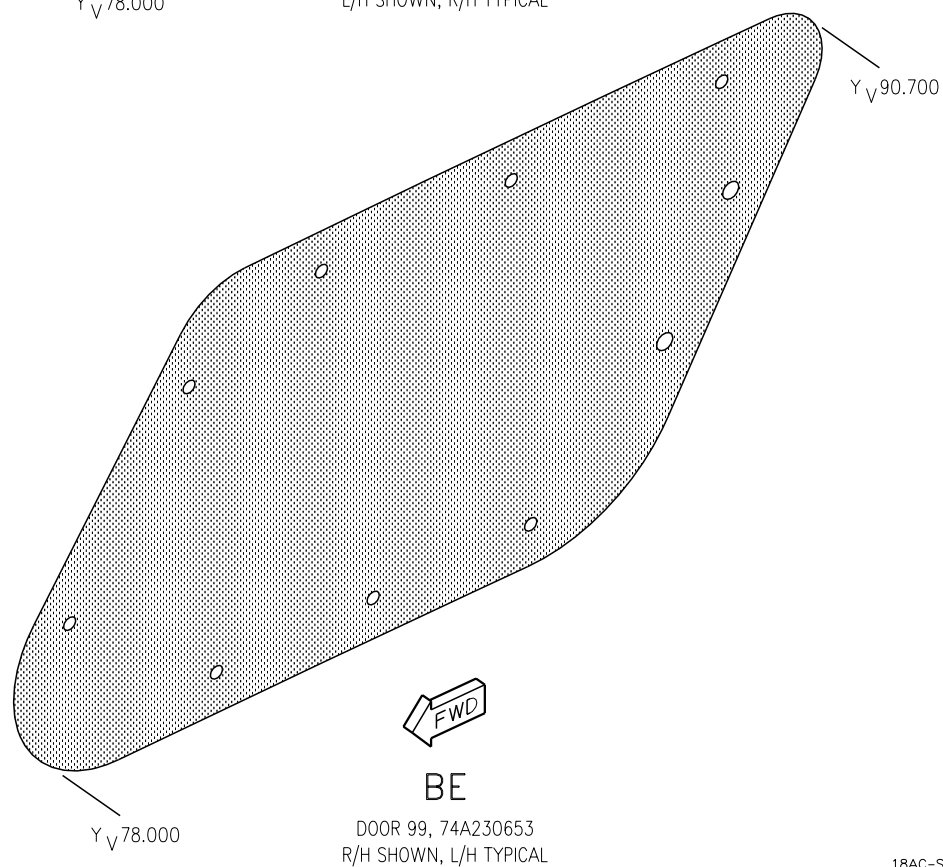
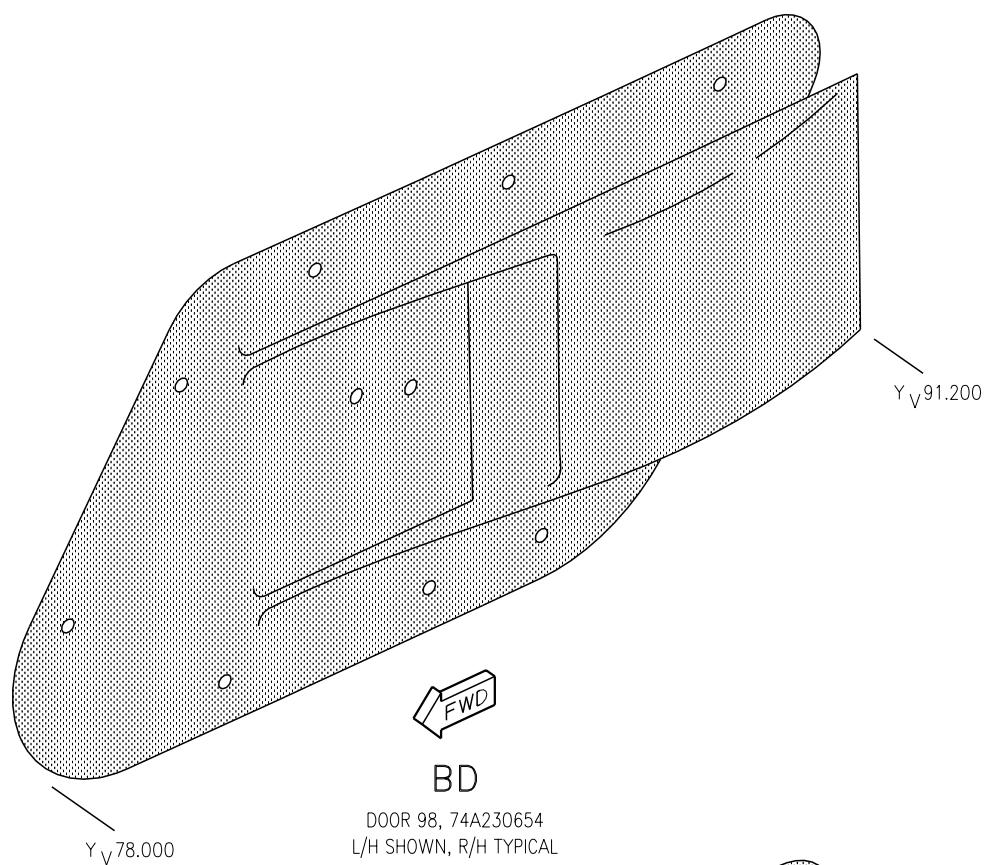
Y<sub>V</sub> 73.646



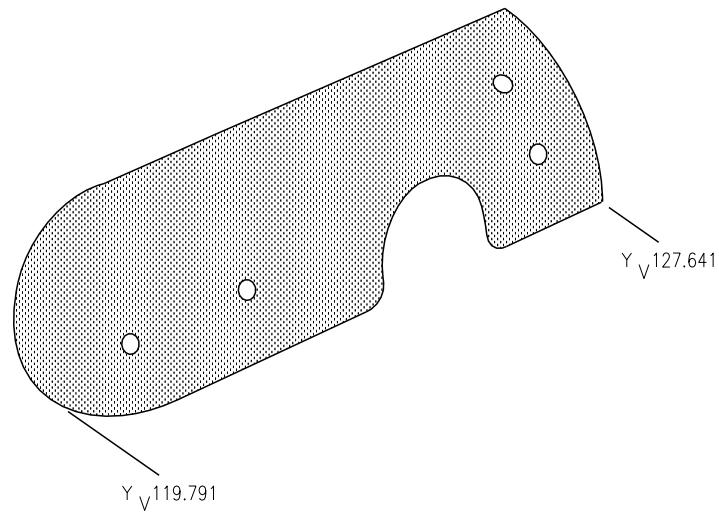
BC

DOOR 97, 74A230657  
R/H SHOWN, L/H TYPICAL

**Figure 1. Location of Conductive Coating (Sheet 27)**

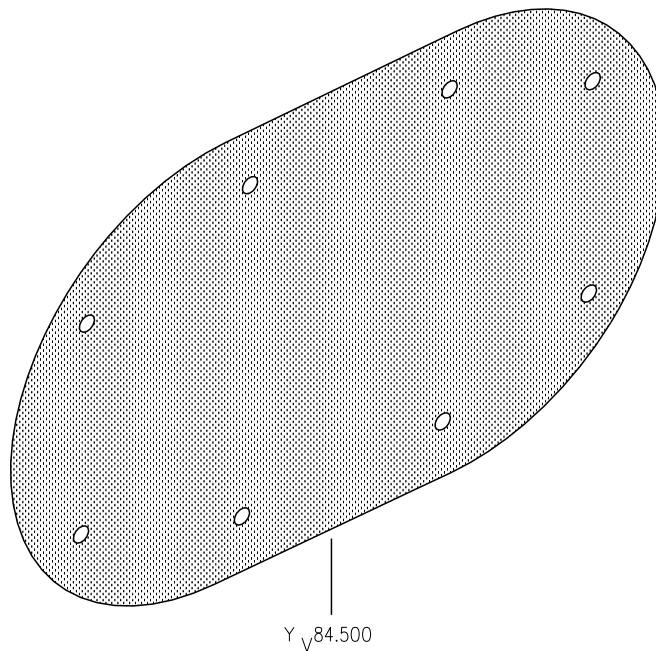


**Figure 1. Location of Conductive Coating (Sheet 28)**



BF

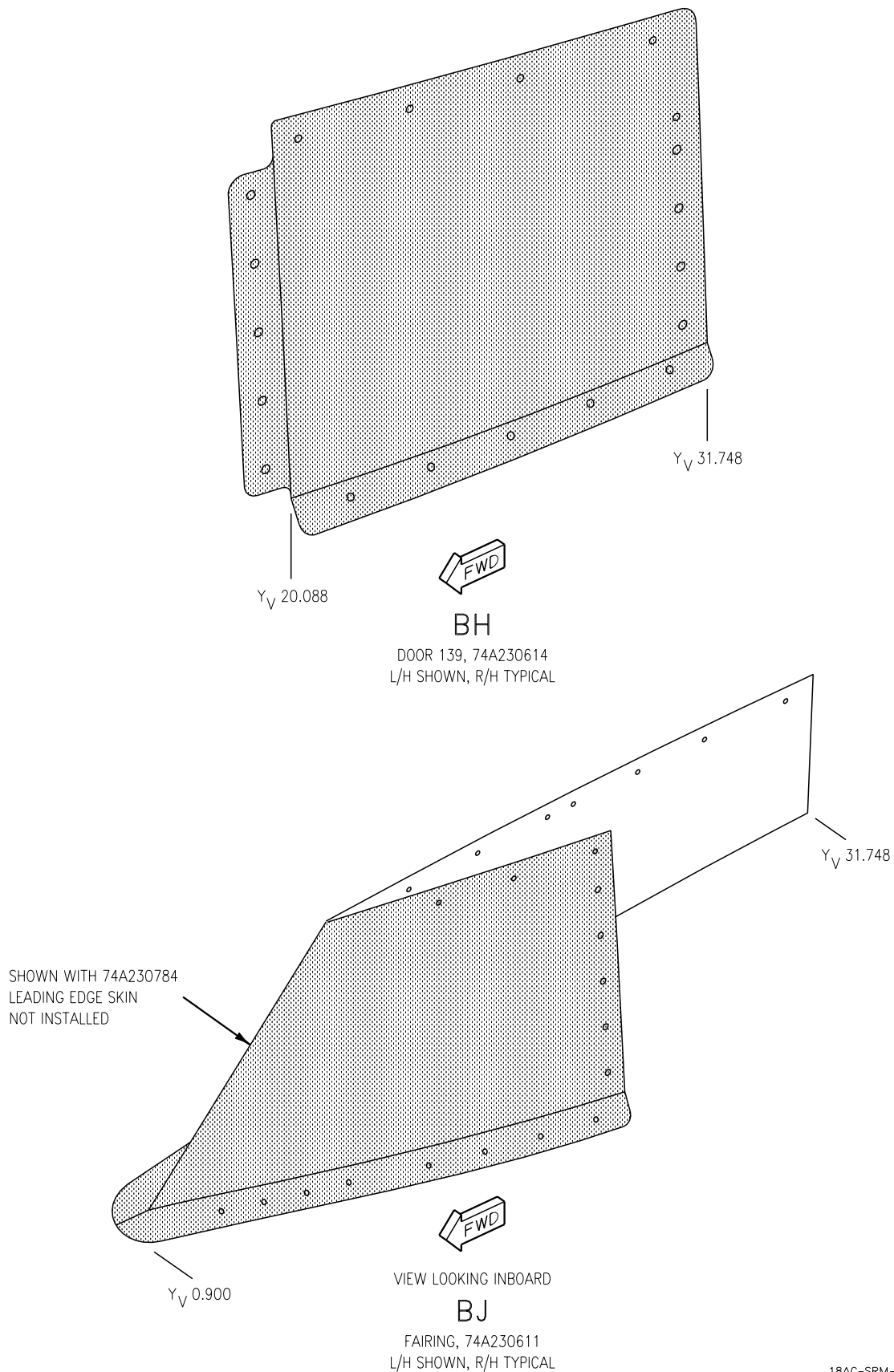
DOOR 122, 74A230805  
L/H SHOWN, R/H TYPICAL



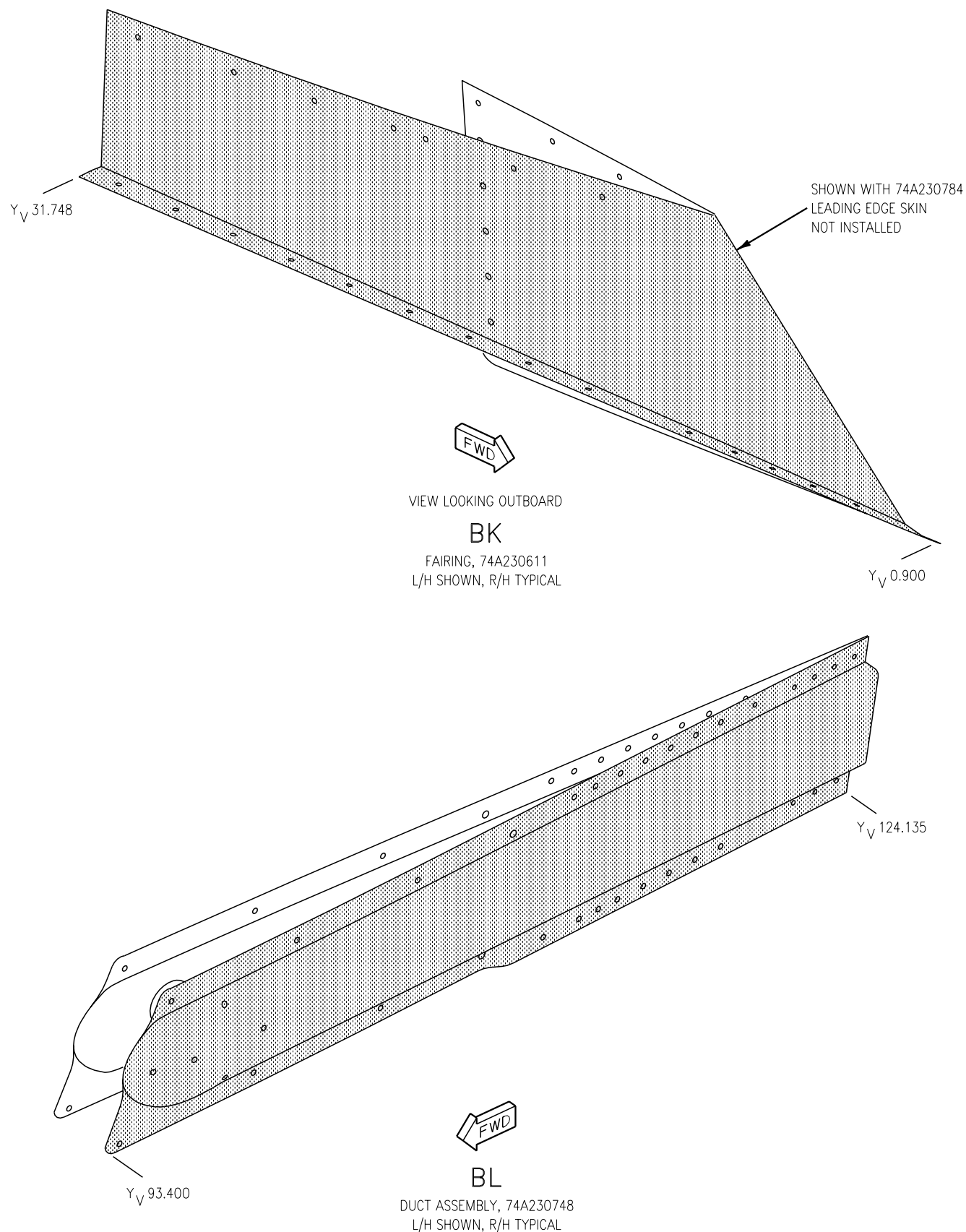
BG

DOOR 126, 74A230656  
R/H SHOWN, L/H TYPICAL

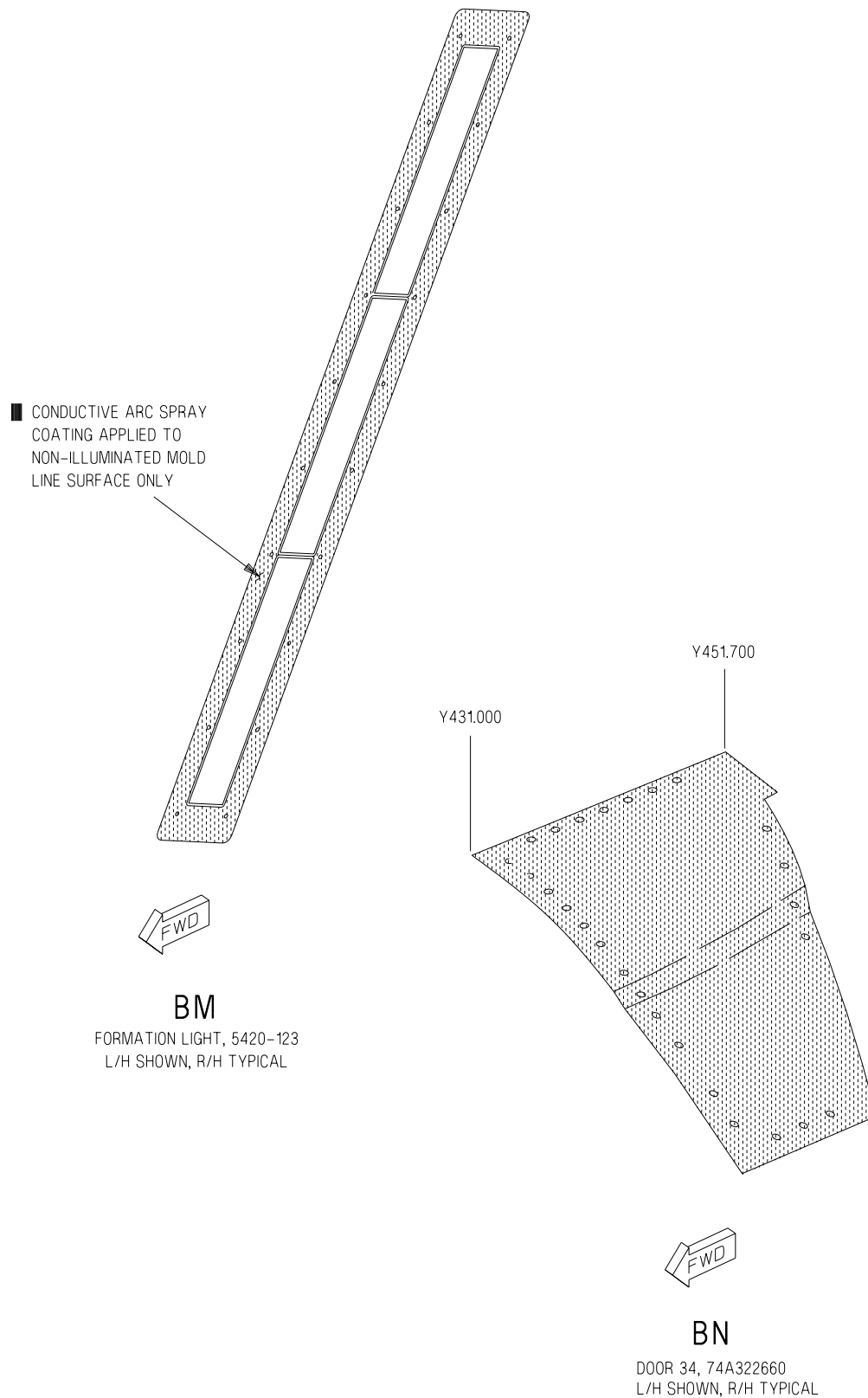
**Figure 1. Location of Conductive Coating (Sheet 29)**



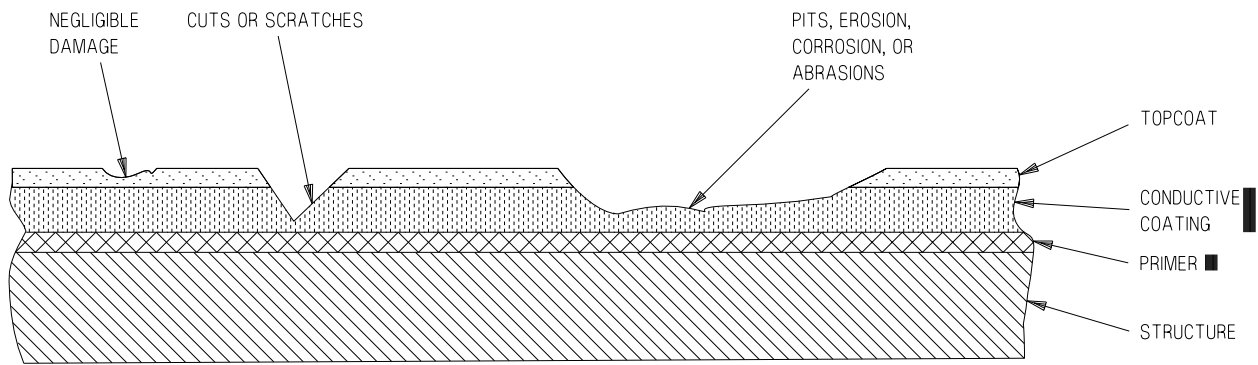
**Figure 1. Location of Conductive Coating (Sheet 30)**



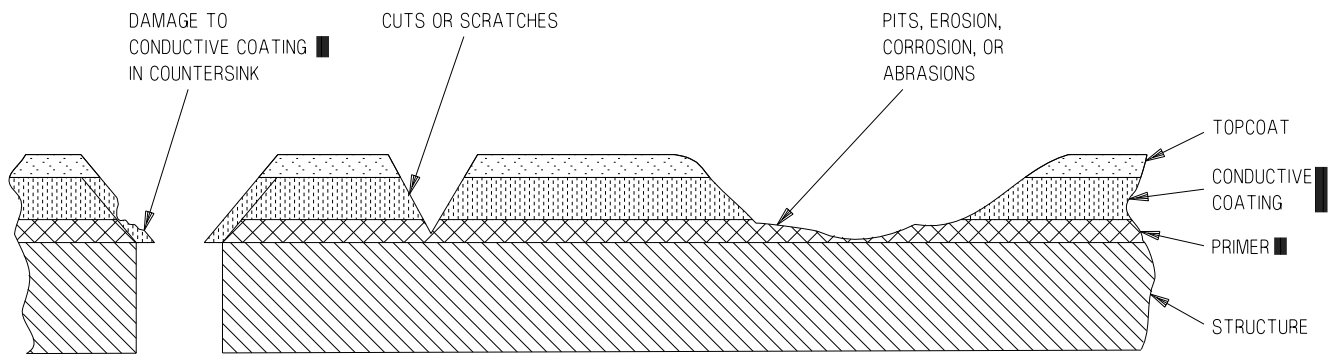
**Figure 1. Location of Conductive Coating (Sheet 31)**



**Figure 1. Location of Conductive Coating (Sheet 32)**



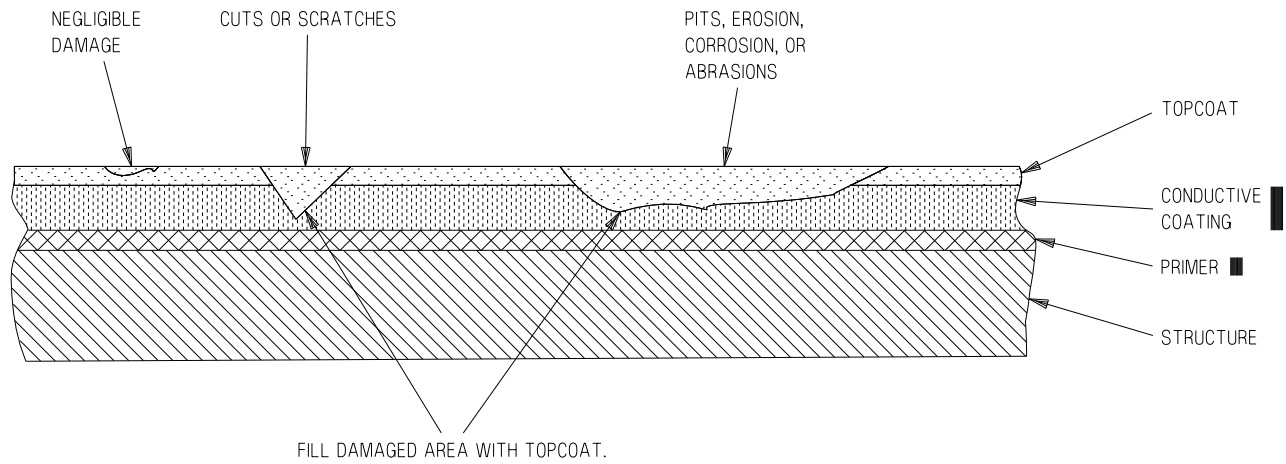
## CLASS I DAMAGE



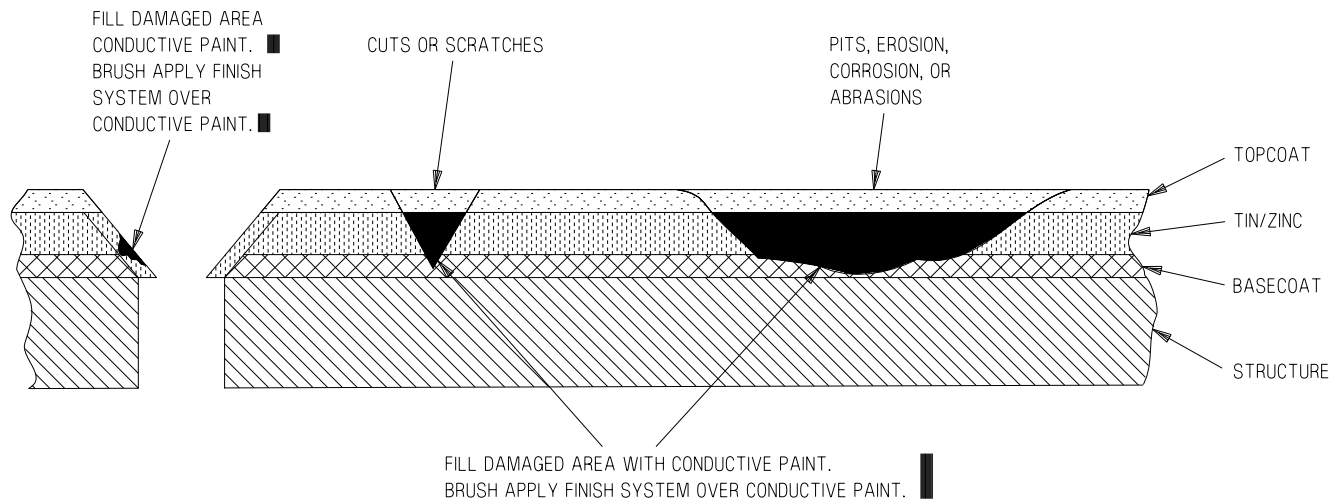
## CLASS II DAMAGE

**Figure 2. Repairable Damage - Conductive Coating**





## CLASS I DAMAGE



## CLASS II DAMAGE

**Figure 3. Repairs - Conductive Coating**

## ORGANIZATIONAL AND DEPOT MAINTENANCE

## STRUCTURE REPAIR

## TYPICAL REPAIR

## ELASTOMERIC COATING

## Reference Material

Structure Repair, General Information .....	A1-F18AC-SRM-200
In-Service-Tolerances .....	WP008 00
Aircraft Corrosion Control.....	A1-F18AC-SRM-500
Chemical Treatment.....	WP008 00
Priming Procedures .....	WP011 00
Finish System .....	WP012 00
Aircraft/Armament Monitor and Control .....	AE-199AG-580-000/(C)
Elastomeric Coating.....	WP003 00
Elastomeric Coating Thickness Check.....	WP004 00

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## Record of Applicable Technical Directives

None

**1. DESCRIPTION.**

2. Elastomeric coating material is black colored material which is sprayed, buttered, trowelled, or bonded onto aircraft surfaces. Material is supplied in kit form.

**3. DAMAGE EVALUATION.** See figure 1.

4. Damage not listed or exceeding limits below requires a depot engineering disposition.

5. **REPAIRABLE DAMAGE.** See figure 2. Repairable damage is damage that can be permanently repaired with no adverse effect on aircraft. Repair to Class I, II, and III damages is organizational maintenance.

6. **Class I Damage.** This class of damage applies to damage which may extend into topcoat or through topcoat and into elastomeric coating. If damage exists to leading edge, damage may extend through topcoat and into rain erosion seal but not into elastomeric coating. For repair of damage, do Class I Repair, this WP.

7. **Class II Damage.** This class of damage applies to damage six inches or less in diameter which may extend through elastomeric coating and primer providing no damage exists to underlying structure. If damage exists to leading edge, damage may extend through rain erosion seal and elastomeric coating providing no damage exists to underlying structure. For repair of damage, do Class II Repair, this WP.

8. **Class III Damage.** Class III damage does not apply to leading edge. This class of damage applies to damage six inches or larger in diameter which may extend through elastomeric coating and primer providing no damage exists to underlying structure. For repair of damage, do Class III Repair-Patch Method, this WP.

**9. Damage to Elastomeric Coating and Underlying Structure.**

a. Remove elastomeric coating as required to evaluate and repair structure. Do Stripping of Elastomeric Coating, this WP.

b. Evaluate and repair structural damage (A1-F18AE-SRM-600 through -750 structure repair manual).

c. Reclassify damage to elastomeric coating. Do Damage Evaluation, this WP.

**10. REPAIRS.** See figure 2.**Support Equipment Required**

Part Number or Type Designation	Nomenclature
74D110165-1001 Applicable Tool Listing Inventory:	Repair Set, Temperature/ Vacuum Control, Composite
74D110165-2001	Temperature Control Assembly
74D110165-2003	Vacuum Control Assembly
74D111252-1001	Cable Assembly
74D111252-1003	Cable Assembly
74D111268-1001	Hose Assembly
74D111270-1001	Connector Assembly
74D111271-1001	Connector Assembly
74D111272-1001	Gage Assembly
74D111312-1001	Vacuum Adjust Valve Assembly

**Materials Required**

Specification or Part Number	Nomenclature
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
020X413	Cleaning Compound
855-1.000IN	Pressure Sensitive Tape
A-A-1047, GRIT 180-9x11 240-9x11	Abrasive Paper
H-B-695, TYPE 1, GRADE A, SIZE 1-1/2	Varnish Brush
WF2406CL3SHEETC	Structural Repair Kit, 12"X12" Elastomeric Sheets
WF2405CL3XX004C	Structural Repair Kit, Elastomeric Repair Material, 4 Oz. Kit
WF1664XXXXXX004C	Structural Repair Kit, Rain Erosion Seal, 4 Oz. Kit
TEMP-R-GLAS6TB 9151-0-500	Teflon Cloth Adhesive Tape

**Materials Required (Continued)**

Specification or Part Number	Nomenclature
WRIGHTLON 7400 A-A-203	Plastic Sheet Paper, Kraft, Untreated
MIL-T-21595 TYPE 1 Pattern 30	Tape, Adhesive Cloth, Netting (Scrim Cloth)

11. **Class I Repair.** Repair applies to three categories of damage.

a. **Leading Edge Surfaces:** Damage through topcoat and into rain erosion seal but not into elastomeric coating. Leading edge surfaces are those which have rain erosion coating over elastomeric coating.

b. **Damage Through Topcoat and Into Elastomeric Coating:** Damage may extend partly through elastomeric coating, however, no primer or bare metal is exposed.

c. **Damage into, but not penetrating topcoat.**

(1) Verify damage qualifies for Class I Repair.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

(2) Clean damaged area with cheesecloth dampened with cleaning compound.

(3) Wipe surface dry with clean, dry cheesecloth before cleaning compound evaporates.

**NOTE**

Do not apply primer over elastomeric coating.

(4) Prepare suitable amount of topcoat. Do preparation and mixing instructions (A1-F18AC-SRM-500, WP012 00).

(5) Apply topcoat to damaged area with small brush.

(6) Allow to air dry until tack free.

12. **Class II Repair.** Class II repair applies to damage which exceeds allowable limits defined in Class I Repair.

**WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

**NOTE**

For damage which exceeds 6 inches in width, Class III Repair may be made instead of Class II.

a. Clean damaged area with clean cheesecloth dampened with cleaning compound.

b. Wipe surface dry with clean, dry cheesecloth before cleaning compound evaporates.

c. Lightly scuff sand with 240 grit or finer abrasive paper.

d. Clean damaged area with clean cheesecloth dampened with cleaning compound.

e. Wipe surface dry with clean, dry cheesecloth before cleaning compound evaporates.

## CAUTION

Make sure metal surfaces have water-break free surface before applying chemical treatment.

f. If damage extends through primer to bare metal, chemically treat bare metal before applying primer. Do chemical treatment procedures (A1-F18AC-SRM-500, WP008 00).

g. If damage extends into or through primer, brush apply primer to repair surface. Do Priming Procedures (A1-F18AC-SRM-500, WP011 00).

h. Mask nearby areas.

## WARNING

Elastomeric repair material is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

## NOTE

Elastomeric repair material has shelf life of 1 year when stored at or below 80 degrees F.

Elastomeric repair material mixed with curing agent has 30 minute pot life. Discard elastomeric repair material when no longer spreadable for buttering.

For leading edge surfaces that do not have damage penetrating black elastomeric coating, steps i through n do not apply. Go to step o.

i. Prepare elastomeric repair material per manufacturer's instructions.

j. Apply elastomeric repair material to damaged area. Slightly overfill damage. Use spatula to help mold repair.

k. Allow elastomeric repair material to air cure for 3 hours at 70 to 100 degrees F.

l. Remove masking.

## WARNING

When sanding elastomeric coating, eye and respiratory protection is required to avoid airborne dust particles.

## NOTE

Slight gumming of abrasive paper is acceptable.

m. Sand repair area flush with adjacent elastomeric coating using 240 grit or finer abrasive paper.

## NOTE

Do not apply primer over elastomeric coating.

n. Apply topcoat as required (A1-F18AC-SRM-500, WP012 00).

## WARNING

Rain erosion seal is highly toxic. Use only in well ventilated areas. Personnel shall not be left unattended. Use extreme caution to prevent bodily contact. Wear rubber gloves. If skin contact is made, flush area thoroughly with water and wash with heavy soap lather.

o. Repair rain erosion seal on leading edge surfaces:

(1) Prepare rain erosion seal per manufactures instructions. Do Application of Rain Erosion Seal, this WP.

(2) Apply rain erosion seal to damaged leading edge area. Slightly overfill damage area. Use spatula to help mold repair.

(3) Allow rain erosion seal to air cure minimum of 8 hours.

(4) Sand area flush with adjacent rain erosion coating using 240 grit or finer abrasive paper.

## NOTE

Do not apply primer over rain erosion seal.

(5) Apply topcoat as required (A1-F18AC-SRM-500, WP012 00).

**13. Class III Repair - Patch Method.** See figure 3. Class III Repair applies to damage which exceeds allowable limits defined in Class I and Class II Repair.



Use care when scribing or cutting out elastomeric coating not to damage underlying structure.

- a. Scribe rectangle or other convenient shape around damaged area.
- b. Remove material out of damaged area. Do Stripping of Elastomeric Coating, this WP.
- c. Mask nearby areas.
- d. Sand damaged area down to primer with 240 grit or finer abrasive paper.

## WARNING

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

- e. Clean damaged area with clean cheesecloth dampened with cleaning compound.
- f. Wipe surface dry with clean, dry cheesecloth before cleaning compound evaporates.



Make sure metal surfaces have water-break free surface before applying chemical treatment.

g. If bare metal is exposed, chemically treat bare metal. Do chemical treatment procedures (A1-F18AC-SRM-500, WP008 00).

h. Apply one coat of primer to damaged area. Do Priming Procedures (A1-F18AC-SRM-500, WP011 00).

## WARNING

Rain erosion seal is highly toxic. Use only in well ventilated areas. Personnel shall not be left unattended. Use extreme caution to prevent bodily contact. Wear rubber gloves. If skin contact is made, flush area thoroughly with water and wash with heavy soap lather.

## NOTE

Rain erosion seal is used as adhesive to bond elastomeric sheet.

i. Prepare rain erosion seal per manufacturer's instructions.

## WARNING

Elastomeric sheet is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

- j. Cut elastomeric sheet approximately 1/8-inch smaller than damaged area.
- k. Cut piece of scrim cloth to same size as elastomeric sheet.
- l. Brush apply rain erosion seal to primed surface, bottom side of elastomeric sheet, and scrim cloth.
- m. Locate scrim cloth into damaged area.

n. Locate elastomeric sheet into damaged area and center.

o. Carefully remove rain erosion seal from perimeter gap with clean dry cheesecloth.

### NOTE

Two locations beyond repair area, fabric must provide air passage for through-the-bag vacuum connections.

p. Apply single layer of teflon cloth over repair area and tape in position with pressure sensitive tape.

q. Apply adhesive tape around outside of repair area.

r. Position plastic sheet over repair area and press into adhesive tape to form vacuum bag.

### NOTE

Through-the-bag vacuum fittings are required for vacuum and static vacuum measurements.

s. Locate through-the-bag fittings. Fittings should be located approximately 1-1/2 inches over excess fabric to apply vacuum and to attach bag to vacuum gage or recorder.

### NOTE

Difference between initial and final gage reading is indicated leakage which must not exceed 2.0 inches Hg. If leakage exceeds 2.0 inches Hg, locate and repair leak and repeat leak check.

t. Connect repair set (74D110165) to repair arrangement per figure 3. Do leak check and cure per steps below:

### NOTE

To pull vacuum of 15 inches of mercury, valve assembly (5) must be connected before connecting hose assembly (6) to vacuum control assembly (2).

(1) Pull vacuum of 20 to 29 inches Hg on bag.

(2) Isolate system.

(3) Take initial gage reading 2 minutes after isolation.

(4) Take final gage readings 2 minutes after initial gage reading.

u. Cure at minimum vacuum of 15 inches Hg for minimum of 12 hours at room temperature or 8 hours at 140 degrees F. After cure, remove vacuum bag and related materials.

### WARNING

Elastomeric repair material is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

### NOTE

Elastomeric repair material has shelf life of 1 year when stored at or below 80 degrees F.

Elastomeric repair material mixed with curing agent has 30 minute pot life. Discard elastomeric repair material when no longer spreadable for buttering.

v. Prepare elastomeric repair material per manufacturer's instructions.

w. Apply elastomeric repair material to perimeter of patch. Overfill and blend to contour using spatula.

x. Allow elastomeric repair material to air cure for 3 hours at 70 to 100 degrees F.

y. Remove masking.



**WARNING**

When sanding elastomeric coating, eye and respiratory protection is required to avoid airborne dust particles.

**NOTE**

Slight gumming of abrasive paper is acceptable.

z. Sand repair area flush with adjacent elastomeric coating using 240 grit or finer abrasive paper.

**NOTE**

Do not apply primer over elastomeric coating.

aa. Apply topcoat as required (A1-F18AC-SRM-500, WP012 00).

**14. SPRAY PROCEDURES FOR ELASTOMERIC COATING (STANDARD MATERIAL), DEPOT MAINTENANCE.** See figure 4. Spray application of elastomeric standard material to areas on aircraft requiring complete recoating is depot maintenance.

**Support Equipment Required**

None

**Materials Required**

Specification or Part Number	Nomenclature
WF2406CL3XX004C	Structural Repair Kit, Elastomeric Standard Material
CCC-C-440 TYPE 1 CLASS 1	Cheesecloth
020X413	Cleaning Compound
APSV331-0.032-0.40	Masking Disks
APSV331-0.032-0.50	Masking Disks
A-A-203	Paper, Kraft, Untreated
MIL-T-21595 TYPE 1	Tape, Adhesive

**Materials Required (Continued)**

Specification or Part Number	Nomenclature
A-A-1047 GRIT 180-9X11 240-9X11	Abrasive Paper

**15. SURFACE PREPARATION.****WARNING**

Cleaning compound is flammable liquid and vapor. May cause allergic respiratory and skin reaction. May cause eye, skin and respiratory irritation. Keep away from heat, sparks, and flame. Do not breathe dust (vapor, mist, gas). Use only with adequate ventilation. Keep container closed. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

a. Thoroughly clean surface using clean cheesecloth dampened with cleaning compound.

b. Wipe surface dry with clean, dry cheesecloth before cleaning compound evaporates.

**CAUTION**

Make sure metal surfaces have water-break free surface before applying chemical treatment.

c. Apply chemical treatment on metal surfaces. Do Chemical Treatment procedures (A1-F18AC-SRM-500, WP008 00).

d. Prime surface. Do Priming Procedures (A1-F18AC-SRM-500, WP011 00).

**16. MASKING.** Mask off areas not to be coated. Apply masking disks over removable fasteners as required. Mask to dimensions given in (AE-199AG-580-000/(C), WP003 00).



## 17. MIXING.

### WARNING

Elastomeric standard material is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

### NOTE

Elastomeric standard material has shelf life of 1 year when stored at or below 80 degrees F.

- a. Remove elastomeric standard material (Part B) from cold storage.

- b. Place elastomeric standard material in an area protected from sun where ambient temperature is 70 to 100 degrees F. Allow material to warm up.

- c. Elastomeric standard material may be warmed by shaking in paint shaker for 10 minutes. Do feel check of material container to determine materials temperature. Temperature of container should be luke warm.

### NOTE

If material temperature is less than 70 degrees F, continue shaking until material temperature is 70 to 85 degrees F.

- d. Measure temperature of material with thermometer.

## NOTE

Elastomeric standard material which is contaminated or partially cured must not be used.

Elastomeric standard material must only be mixed with curing agent having same control number.

Elastomeric standard material mixed with curing agent shall be used within 6 hours of mixing. Material over 6 hours old must be discarded.

e. Mix elastomeric standard material (Part B) with curing agent (Part A). Thin to desired spray viscosity using thinner (Part C). Follow labeled instructions provided with each container of material.

## 18. SPRAY PROCEDURE.

### WARNING

A full face, air supplied respirator must be worn during spray operations.

### CAUTION

Spray applied elastomeric standard material shrinks slightly during cure. Allow for approximately 15 percent thickness reduction from wet film to dry film. Shrinkage is complete after 5 hours cure.

When using pressure pot and suction feed equipment, periodically check pot agitator to make sure it is functioning correctly. Constant agitation is essential to prevent settling of pigment used in elastomeric standard material.

a. Spray apply thin coats of elastomeric standard material. Allow to air dry 10 to 35 minutes

between coats. Repeat sequence to get correct coating thickness.



**19. CURING PROCEDURE.**

- a. Coating shall be cured at least 5 hours at 70 to 100 degrees F before sanding or thickness check.

**NOTE**

Topcoat may be applied to elastomeric standard material 30 minutes or more after last coat has been applied, except for parts or assemblies which thickness must be determined.

**20. APPEARANCE CHECK.**

- a. Verify coating appearance is free of runs, sags, craters, blisters, or other irregularities.

**WARNING**

When sanding elastomeric coating, eye and respiratory protection is required to avoid airborne dust particles.

- b. If required, sand coating with 180 grit or finer abrasive paper to get a smooth surface.

**21. THICKNESS CHECK.**

- a. For each coated area take required number of thickness measurements. Do Elastomeric Coating Thickness Check (AE-199AG-580-000/(C), WP004 00).

**NOTE**

Do not apply primer over elastomeric coating.

- 22. APPLICATION OF TOPCOAT.** Apply topcoat as required. Do Preparation and Application procedures (A1-F18AC-SRM-500, WP012 00).

**23. APPLICATION OF RAIN EROSION**

**SEAL.** When required, elastomeric coating shall be coated with rain erosion seal to provide protection against rain erosion. Application of rain erosion seal is organizational maintenance. For location of areas requiring rain erosion seal, refer to Elastomeric Coating (AE-199AG-580-000/(C), WP003 00).

**Support Equipment Required**

None

**Materials Required****Specification  
or Part Number****Nomenclature**

WF1664XXXXX004C

Structural Repair Kit,  
Rain Erosion Seal,  
4 Oz. Kit

CCC-C-440 TYPE 1  
CLASS 1

Cheesecloth

A-A-203

Untreated Kraft Paper

MIL-T-21595 TYPE 1

Tape, Adhesive

H-B-695, TYPE 1,  
GRADE A, SIZE

Varnish Brush

1-1/2

TT-N-95, TYPE 2

Aliphatic Naptha

**WARNING**

Aliphatic naptha is highly flammable. Do not use near open flame or sparks. Use only in well ventilated areas.

**NOTE**

If elastomeric coating has been applied for more than 24 hours, clean surface with cheesecloth dampened with aliphatic naptha before application of rain erosion seal.

- a. Mask nearby areas.

**NOTE**

Base material shall only be mixed with curing agent having same control number.

Fully thinned and mixed rain erosion seal shall be used within 4 hours. Mixed material over 4 hours old must be discarded.

Rain erosion seal has shelf life of 1 year when stored at or below 80 degrees F.

b. Prepare rain erosion seal per manufacturer's instructions.

**NOTE**

Spray apply rain erosion seal per step c.  
Brush apply rain erosion seal per step d.

c. Spray application of rain erosion seal:

**NOTE**

When spraying rain erosion seal, dry film thickness will be 20 to 25 percent less than wet film thickness. To get dry film thickness of 0.010 to 0.035 inch thickness, wet film thickness must be 0.013 to 0.044 inch.

(1) Add by volume 55 parts thinner (Part C) to 45 parts of mixed material (Part B) and mix thoroughly.

(2) Spray apply 0.002 to 0.006 inch of rain erosion seal. On vertical or overhead surfaces, apply maximum of 0.004 inches to avoid runs and sags.

(3) Allow to air dry for 10 to 30 minutes.

(4) Repeat spray sequence until dry film thickness of 0.010 to 0.035 inch is applied.

(5) Allow rain erosion seal to air cure for minimum of 5 hours before sanding.

(6) After curing, visually check surface appearance of rain erosion coating. Do Appearance Check, this WP.

**NOTE**

Do not apply primer over rain erosion seal.

(7) Apply topcoat as required (A1-F18AC-SRM-500, WP012 00).

d. Brush application of rain erosion seal:

(1) Brush apply dry film thickness of 0.010 to 0.035 inch.

(2) Allow rain erosion seal to air cure for minimum of 8 hours.

(3) After curing, visually check surface appearance of rain erosion coating. Do Appearance Check, this WP.

**NOTE**

Do not apply primer over rain erosion seal.

(4) Apply topcoat as required (A1-F18AC-SRM-500, WP012 00).

**24. STRIPPING OF ELASTOMERIC COATING.** Stripping of elastomeric coating is organizational maintenance.

**Support Equipment Required**

None

**Materials Required**

Specification or Part Number	Nomenclature
A-A-1047, GRIT 240-9X11	Abrasive Paper

**WARNING**

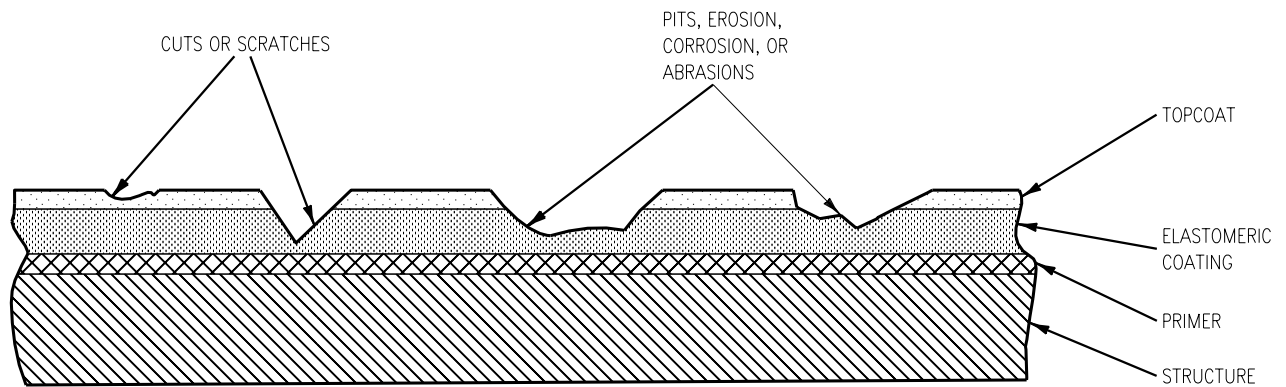
Elastomeric coating must be removed using procedures below. Method of removing coating other than stated below requires a depot engineering disposition.

a. Remove elastomeric coating using plastic scraper.

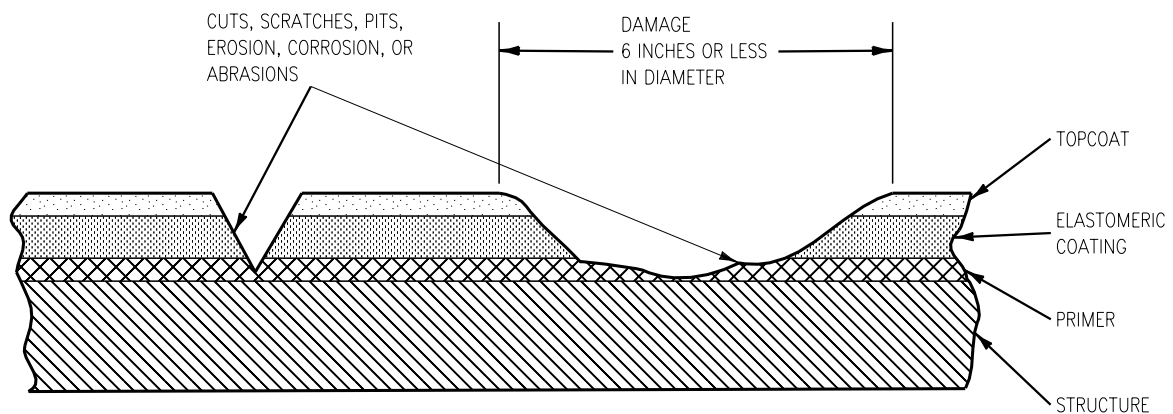
**WARNING**

When sanding elastomeric coating, eye and respiratory protection is required to avoid airborne dust particles.

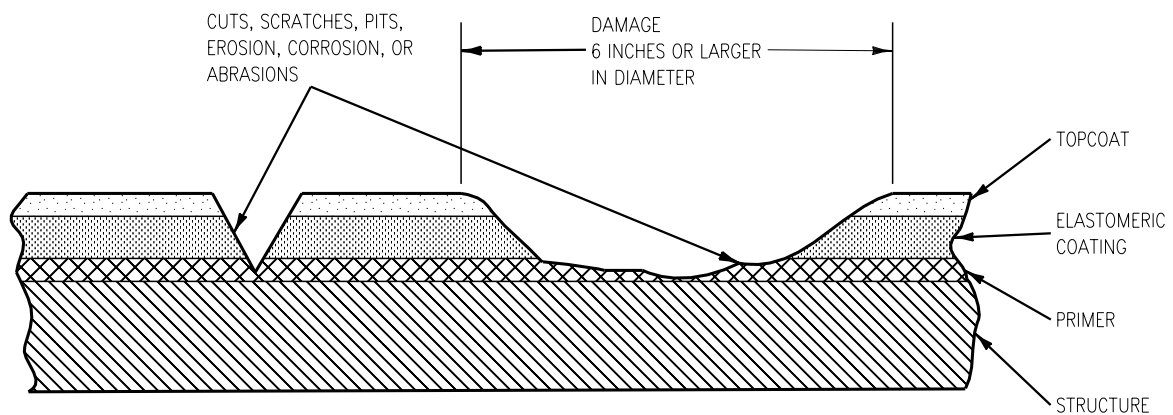
b. Remove any residual coating using abrasive paper.



CLASS I DAMAGE

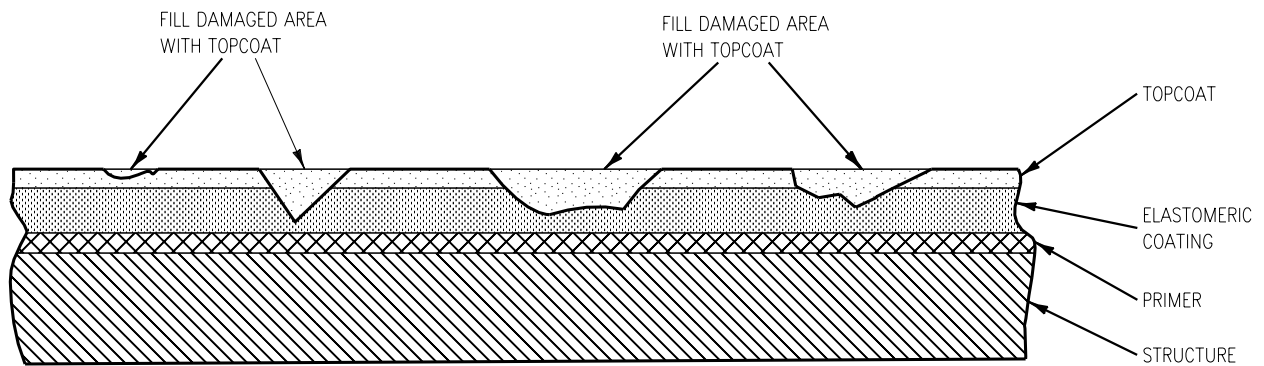


CLASS II DAMAGE

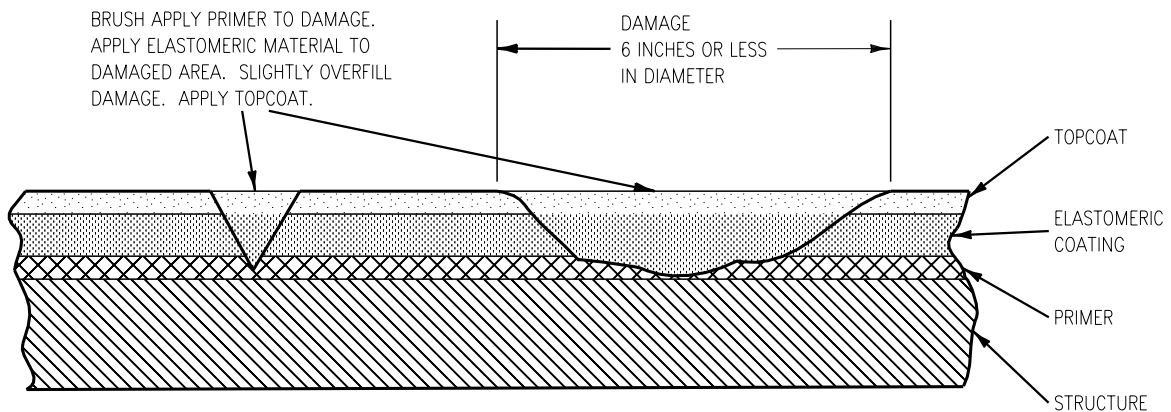


CLASS III DAMAGE

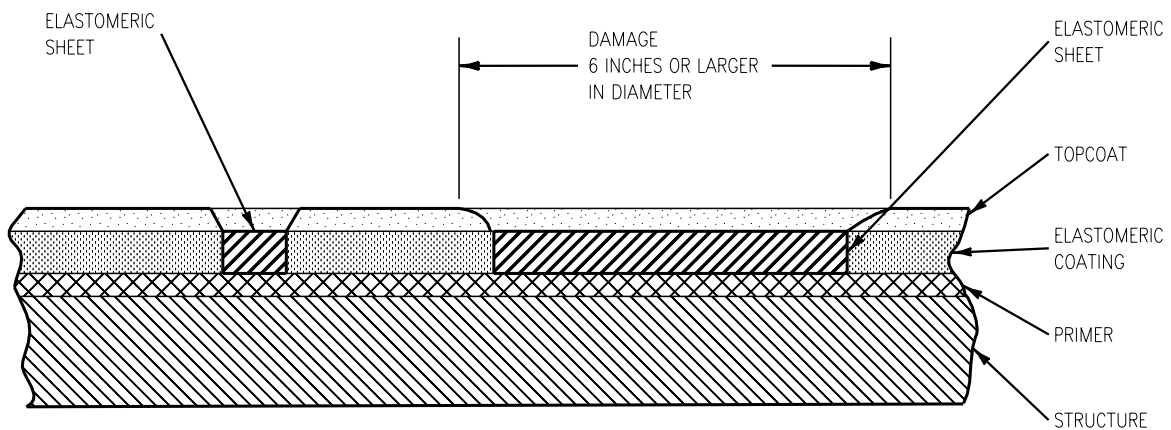
**Figure 1. Damage Evaluation - Elastomeric Coating**



CLASS I DAMAGE



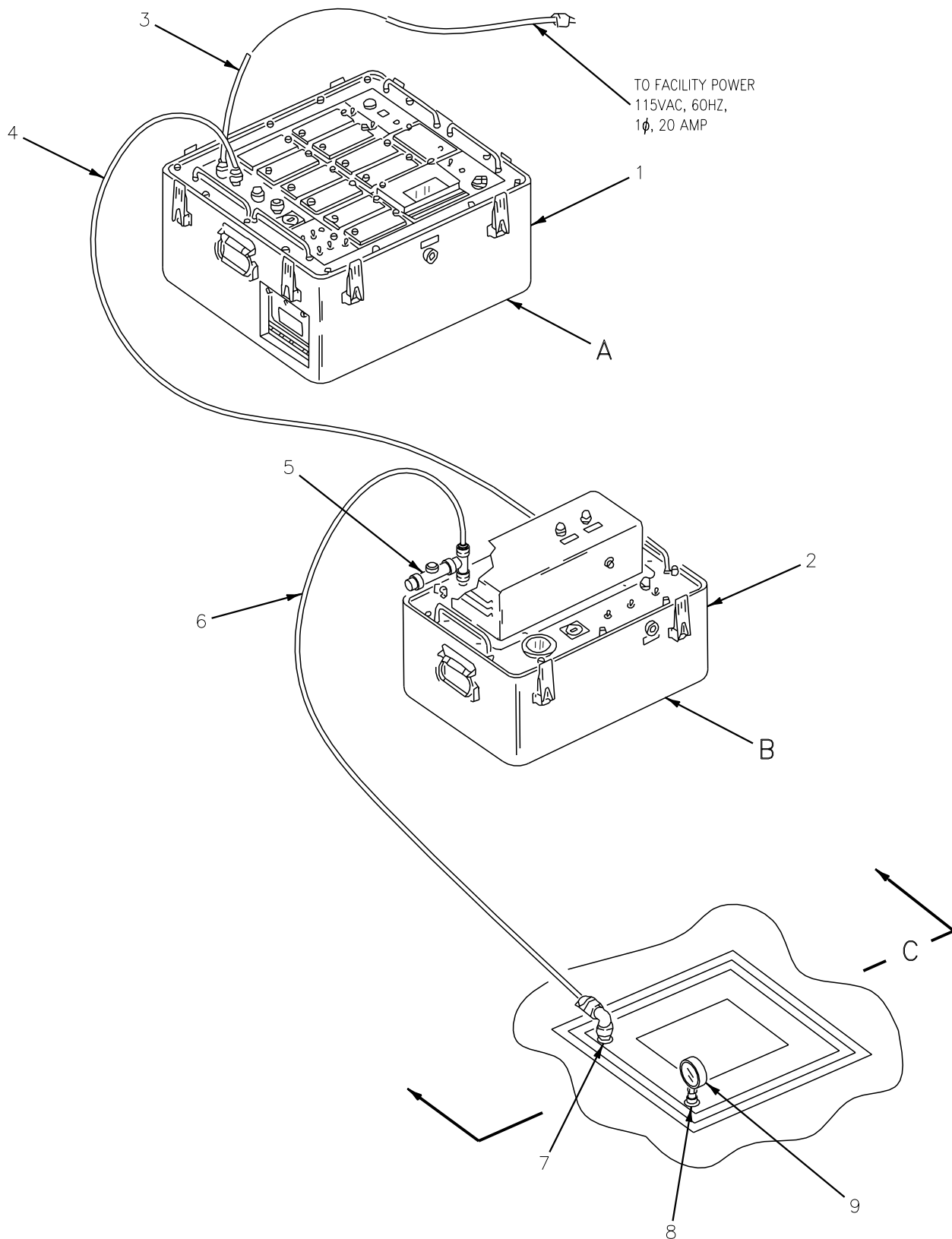
CLASS II DAMAGE



CLASS III DAMAGE

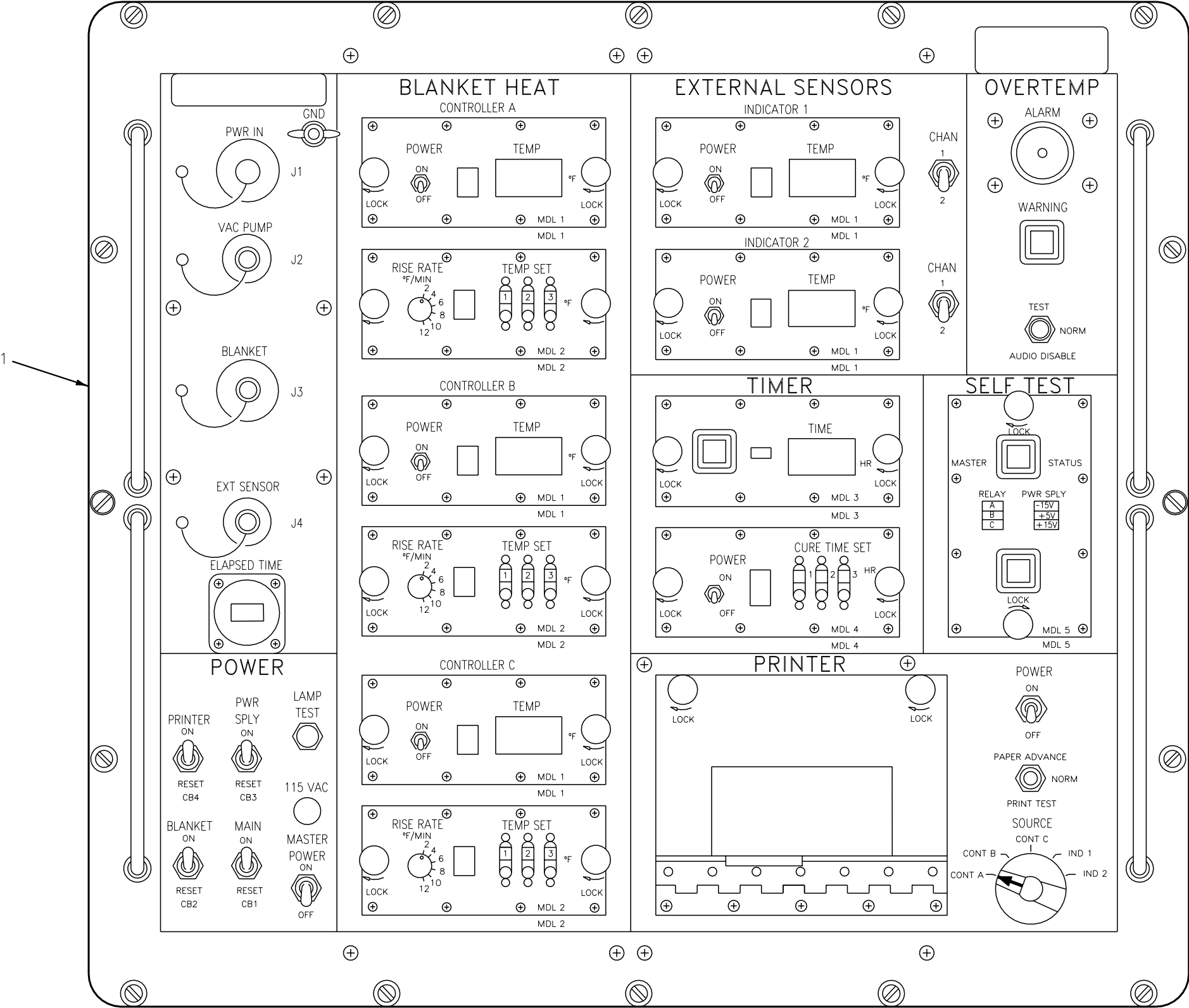
**Figure 2. Repairs- Elastomeric Coating**





18AC-SRM-25-(77-1)24-SCAN

**Figure 3. Vacuum Bag Set-Up for Elastomeric Sheet Repair (Sheet 1)**



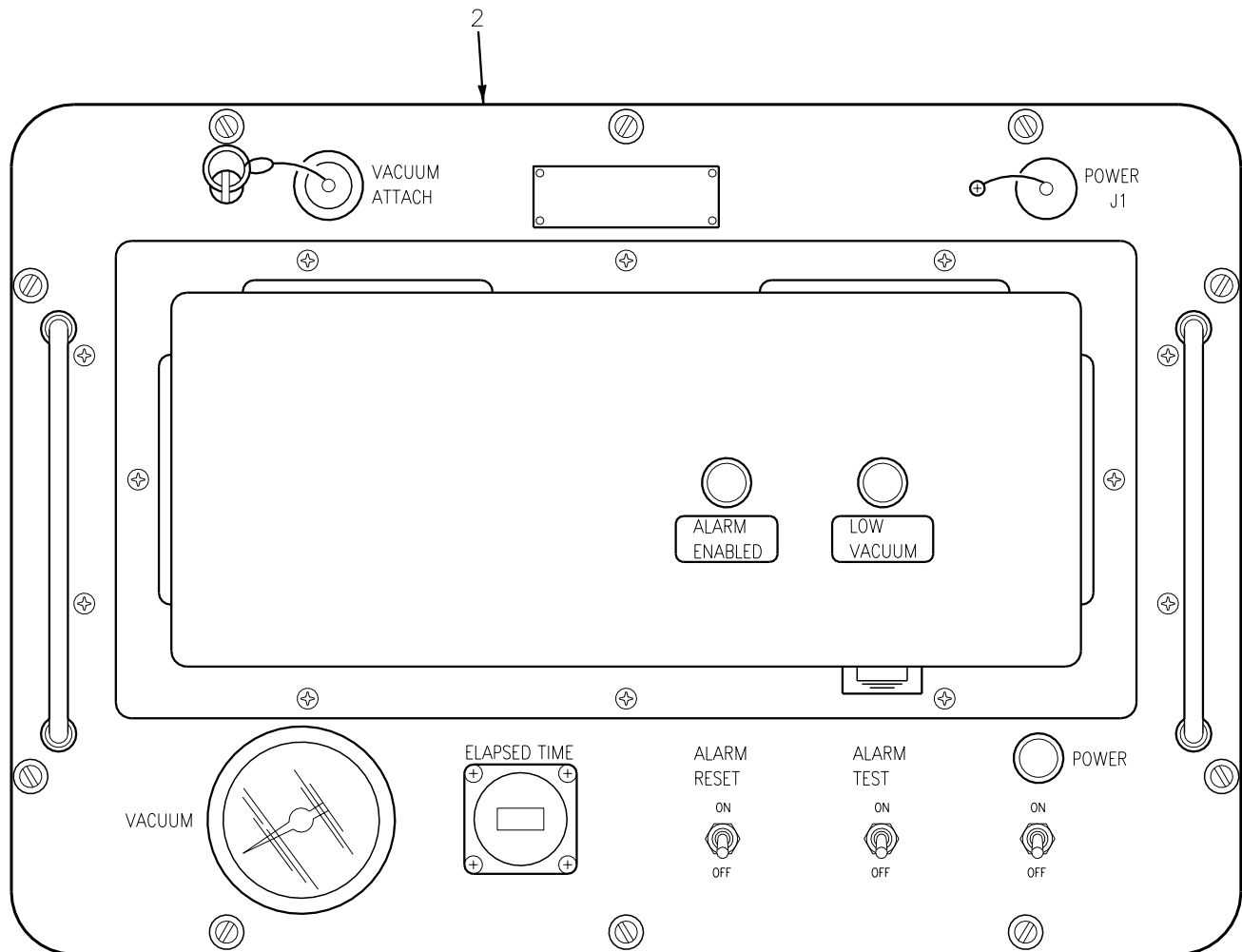
A  
TEMPERATURE CONTROL PANEL ASSEMBLY

Figure 3.

Figure 3. Vacuum Bag Set-Up for Elastomeric Sheet Repair (Sheet 2)

Figure 3.

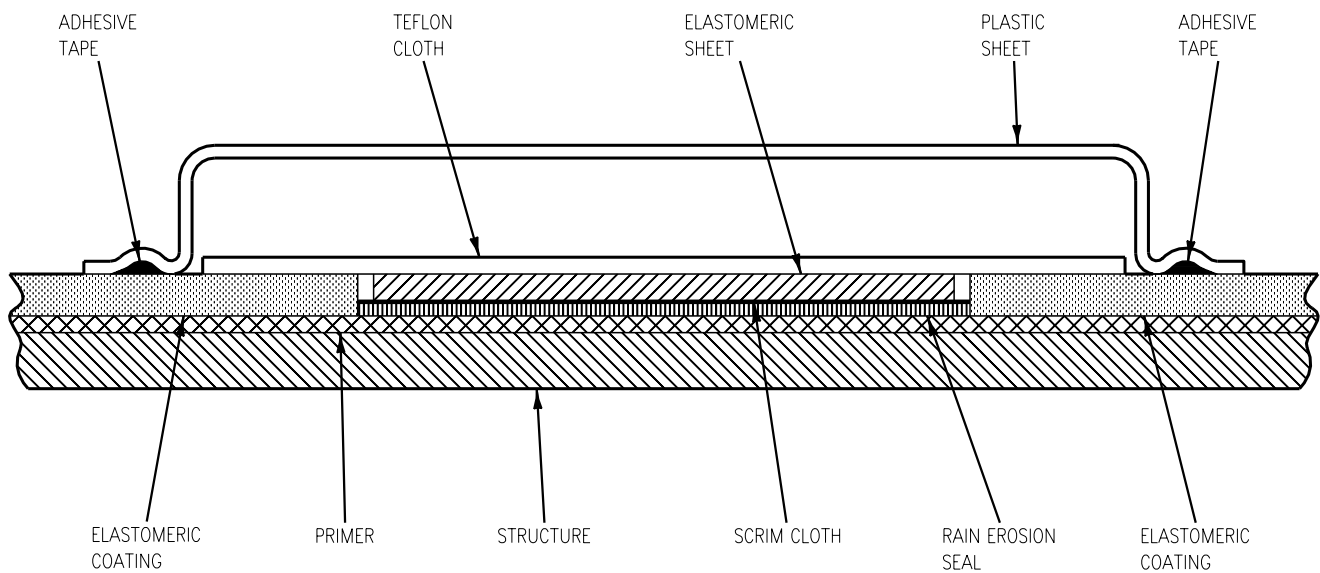




B

VACUUM CONTROL PANEL ASSEMBLY

**Figure 3. Vacuum Bag Set-Up for Elastomeric Sheet Repair (Sheet 3)**

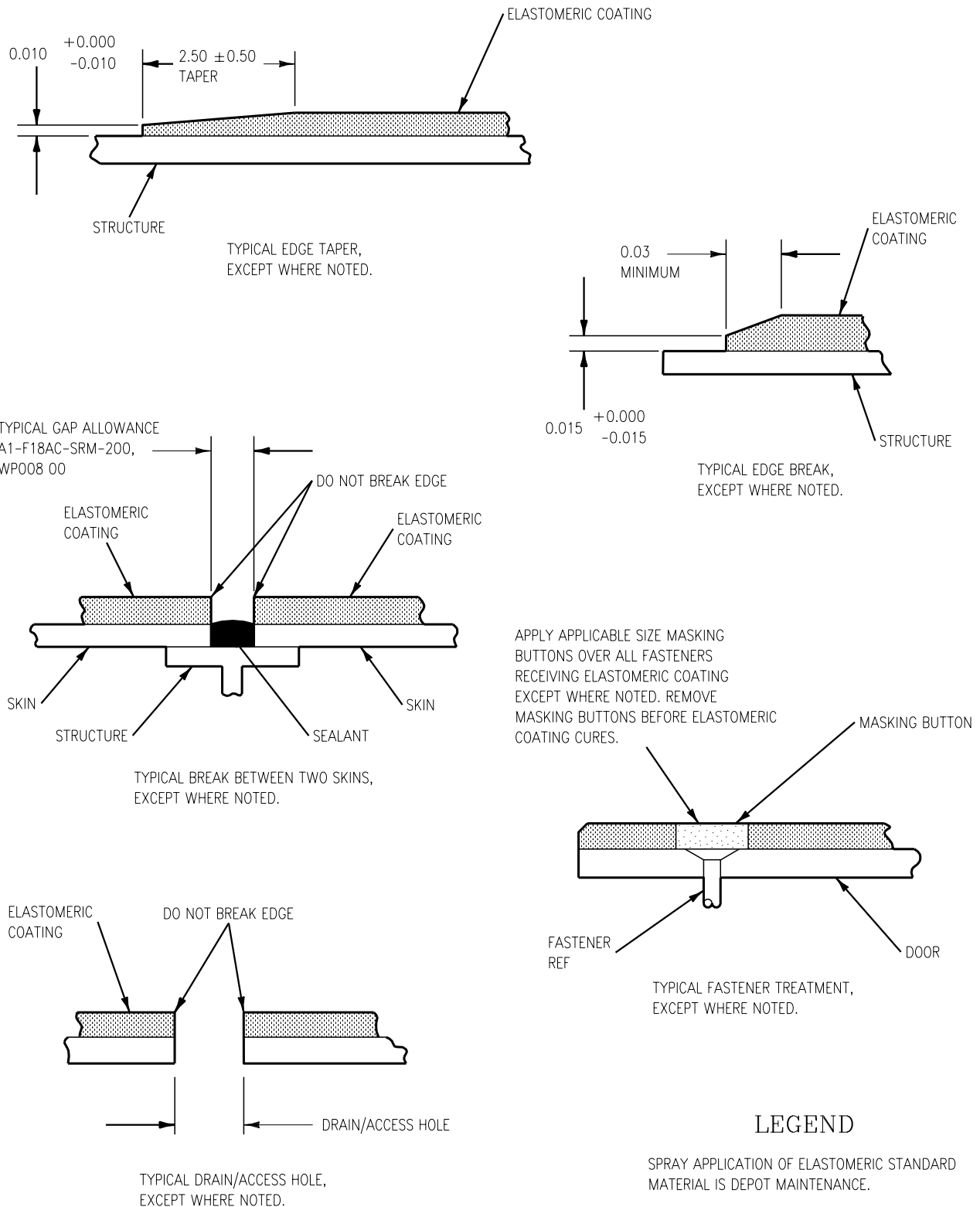


C

**Figure 3. Vacuum Bag Set-Up for Elastomeric Sheet Repair (Sheet 4)**

INDEX NO.	NOMENCLATURE	SPECIFICATIONS OR PART NUMBER
1	TEMPERATURE CONTROL ASSEMBLY	74D110165-2001
2	VACUUM CONTROL ASSEMBLY	74D110165-2003
3	CABLE ASSEMBLY	74D111252-1001
4	CABLE ASSEMBLY	74D111252-1003
5	VACUUM ADJUST VALVE ASSEMBLY	74D111312-1001
6	HOSE ASSEMBLY	74D111268-1001
7	CONNECTOR ASSEMBLY	74D111270-1001
8	CONNECTOR ASSEMBLY	74D111271-1001
9	GAGE ASSEMBLY	74D111272-1001

**Figure 3. Vacuum Bag Set-Up for Elastomeric Sheet Repair (Sheet 5)**



**Figure 4. Spray Application of Elastomeric Coating (Standard Material)**

